REVIEWS AND APPROVALS

EDWIN B. FORSYTHE NATIONAL WILDLIFE REFUGE

ANNUAL NARRATIVE REPORT

Calendar Years 1994-99

Refuge Manager

Date

Associate Manager

Date

Regional Office Approval

Date

		Page
	TABLE OF CONTENTS	i
	<u>INTRODUCTION</u>	1
	A. <u>HIGHLIGHTS</u>	3
	B. <u>CLIMATIC CONDITIONS</u>	4
	C. LAND ACQUISITION	
1. 2. 3.	Fee Title	eport
	D. <u>PLANNING</u>	
1. 2. 3. 4. 5. 6.	Master Plan	eport eport eport 16
	E. <u>ADMINISTRATION</u>	
1. 2. 3. 4. 5. 6. 7.	Personnel Youth Programs Other Manpower Programs Volunteer Program Funding Safety Technical Assistance Other	22 22 23 27 27

F. HABITAT MANAGEMENT

1.	General	
2.	Wetlands	
3.	Forests	Nothing to Report
4.	Croplands	Nothing to Report
5.	Grasslands	
6.	Other Habitats	
7.	Grazing	
8.	Haying	Nothing to Report
9.	Fire Management	
10.	Pest Control	
11.	Water Rights	Nothing to Report
12.	Wilderness and Special Areas	
13.	WPA Easement Monitoring	Nothing to Report
	C WILDLIEF	
	G. <u>WILDLIFE</u>	
1.	Wildlife Diversity	
2.	Endangered and/or Threatened Species	
3.	Waterfowl	
4.	Marsh and Water Birds	
5.	Shorebirds, Gulls, Terns and Allied Species	
6.	Raptors	
7.	Other Migratory Birds	
8.	Game Mammals	
9.	Marine Mammals	
10.	Other Resident Wildlife	
11.	Fisheries Resources	
12.	Wildlife Propagation and Stocking	
13.	Surplus Animal Disposal	9
14.	Scientific Collection	
15.	Animal Control	
16. 17.	Marking and Banding Disease Prevention and Control	
	H. PUBLIC USE	
1.	General	50
2.	Outdoor Classrooms - Students	
3.	Outdoor Classrooms - Teachers	

H. PUBLIC USE (Continued)

4.	Interpretive Foot Trails	62
5.	Interpretive Tour Routes	. Nothing to Report
6.	Interpretive Exhibits/Demonstrations	63
7.	Other Interpretive Programs	. Nothing to Report
8.	Hunting	63
9.	Fishing	66
10.	Trapping	67
11.	Wildlife Observation	68
12.	Other Wildlife Oriented Recreation	
13.	Camping	. Nothing to Report
14.	Pienicking	70
15.	Off-Road Vehicling	70
16.	Other Non-Wildlife Oriented Recreation	. Nothing to Report
17.	Law Enforcement	
18.	Cooperating Associations	78
19.	Concessions	. Nothing to Report
	I. EQUIPMENT AND FACILITIES	
1.	New Construction	81
2.	Rehabilitation	
3.	Major Maintenance	
4.	Equipment Utilization and Replacement	<u> </u>
5.	Communications Systems	
6.	Computer Systems	
7.	Energy Conservation	
8.	Other	-
	J. OTHER ITEMS	
1.	Cooperative Programs	. Nothing to Report
2.	Other Economic Uses	
3.	Items of Interest	•
4.	Credits	84
	K. FEEDBACK	85

L. <u>INFORMATION PACKET</u> - - - (inside back cover)

INTRODUCTION

Edwin B. Forsythe National Wildlife Refuge is located on the Atlantic Ocean coast in southeastern New Jersey extending from Brick Township south to Galloway Township. It is one of the original four United States wetlands designated as a "Wetlands of International Importance" under the United Nations Convention on Wetlands of International Importance, also known as the Ramsar Convention. E. B. Forsythe National Wildlife Refuge was created in 1984 by combining the former Brigantine and Barnegat National Wildlife Refuges. At the end of 1999, the refuge totals over 44,000 acres of coastal salt meadow, upland field, woodland, open bays and channels, and barrier beach.

Brigantine Division was established on October 5, 1939, under the authority of the Migratory Bird Conservation Act to preserve estuarine habitats important to the Atlantic brant (*Branta bernicla hrota*) and to provide nesting habitats for American black ducks (*Anas rubripes*) and rails. The division encompasses about 24,000 acres, located in Atlantic. Burlington, and Ocean Counties. The division is bounded on the east by the Atlantic Ocean and on the north and west by U.S. Route 9.

Barnegat Division was established on July 1, 1967, under the same authority, with the basic objective of preserving estuarine feeding and resting habitat for ducks and brant. The division encompasses about 20,000 acres in Ocean county from the Reedy Creek Unit in Brick Township to the Holgate Unit in Long Beach Township.

Edwin B. Forsythe National Wildlife Refuge is located entirely within the Atlantic Coastal Plain, with elevations ranging from sea level to 50 feet above mean sea level (msl). Estuarine marsh dominated by salt marsh cordgrass (*Spartina alternaflora*) and saltmeadow cordgrass (*S. patens*) is the most abundant habitat. Most of the marsh had been ditched in the past for mosquito control. Palustrine forested wetlands on the Barnegat Division are dominated by red maple (*Acer rubrum*), oaks (*Quercus spp.*), black gum (*Nyssa sylvatica*), sweetgum (*Liquidambar styraciflua*), and occasional stands of Atlantic white cedar (*Chamaecyparis thyoides*). Grasslands occur mainly at the interface between the salt marsh and woodlands. Upland woodlands are dominated by pitch pine (*Pinus rigida*), and various oaks, while reverting grasslands contain forbs and grasses interspersed with sassafras (*Sassafras albidum*), eastern red cedar (*Juniperus virginiana*), and winged sumac (*Rhus copallina*).

Two large managed impoundments are an important feature of the Brigantine Division. These impoundments were established in the early 1950's by construction of a dike system in the coastal saltmarsh around the mouth of Doughty Creek. The West Pool (329 ha.) is managed as a freshwater impoundment (<8 ppt salinity). For decades, freshwater has been held in the West Pool to provide habitat diversity for waterfowl, shorebirds, and wading birds. The pool is managed to provide resting and feeding habitat during the fall

and spring migrations and provides critical wintering habitat. During the summer, the pool provides brood habitat for waterfowl. The East Pool (217 ha.) is managed as a brackish impoundment (10-30 ppt salinity). It is primarily managed to provide waterfowl nesting and brood-rearing habitat. Additional freshwater areas at Brigantine Division include the Experimental Pool (spring fed), a sand borrow pit, and a gravel pit both of which are fed by precipitation and upland runoff. Three freshwater impoundments are located on the Barnegat Division. These areas were formed by plugging old mosquito control ditches and channels and are fed by upland streams. Management activities focus to provide migration, winter, and brood-rearing habitat for waterfowl, shorebirds, and other waterbirds.

The Holgate Unit, Little Beach Island, and the unaltered salt marsh areas of the refuge comprise the 6.603 acre Brigantine Wilderness. The Holgate Unit consists of 450 acres of barrier beach, dunes, and tidal saltmarsh located at the southern tip of Long Beach Island. It was donated by the National Audubon Society in 1960 and is administered by the Barnegat Division. Holgate is one of New Jersey's most important areas for beachnesting birds, and is the state's most productive area for piping plovers (Charadrius *melodus*). It has also been the site of one of the largest least tern (Sterna antillarum) colonies and the largest black skimmer (Rynchops niger) colony in the state. It lies between Little Egg Inlet to the north and Brigantine Inlet to the south, stretching approximately 5 miles in length, and can only be reached by boat. Little Beach Island consists of barrier beach, dunes and tidal saltmarsh which provides a variety of habitat to be used by waterfowl, marsh birds, and shorebirds for nesting, migration, and wintering. The island is very important to beach-nesting birds such as the piping plover, American oystercatcher (Haematopus palliatus), and the willet (Catoptrophorus semipalmatus). Both the Holgate Unit and Little Beach Island are subject to drastic changes in appearance due to coastal storms (especially "nor'easters") and hurricanes.

The refuge's primary objective is to preserve and manage wetlands and other habitats for federal trust resources including migratory birds (especially waterfowl, shorebirds, wading birds and other waterbirds) and threatened and endangered species, as well as other native wildlife. Habitats are specifically managed for production, migration and wintering habitat. Another objective is to perpetuate existing habitat that benefits rare or federally-listed species (threatened and endangered species).

The predominant public uses of the refuge include wildlife interpretation, wildlife observation and photography, boating, fresh- and saltwater fishing, clamming, crabbing, waterfowl hunting, deer hunting, furbearer trapping, and environmental education.

A. HIGHLIGHTS

1994-

On April 7, 1994 staff erected a refurbished base radio tower which stood at 40 feet (formerly at 12 feet). Communications were greatly improved to the Barnegat Division.

1995-

The refuge dikes and impoundments received a prescribed burn for the first time since 1991 (Section F.9).

Federal government furloughs and shutdowns affected refuge operations and activities (Sections E.8, H1,H2, H8, H.11 and H17).

The newly acquired "Waterford Tract" at the Barnegat Division was dedicated (Section C.1).

Extensive use of predator exclosures for piping plover increased hatching success (Section G.2).

A 1996 white Ford Bronco was delivered to replace the 1989 Law Enforcement Jeep (Section I.5).

A new telephone system was installed at the Brigantine Division (Section I.5).

1997-

A new phone system was installed at the Barnegat Division to replace the old system that was destroyed by a lightning strike in August, 1996 (Section I.5).

The refuge received new computers for each of the Barnegat Division staff members (Section I.6).

The Reedy Creek Trail (DeCamp Trail) was dedicated (Section H.4).

The William Vogt Pool (West Pool) subdivision was finished. A new dike known as the "Long Dike", creating the new Northwest and Southwest Pools (Section I.1).

A private contractor demolished and removed a refuge house known as the McDonald House in the town of New Gretna (Section I.8).

1998-

The *Friends of Forsythe N.W.R.* was established to support the refuge and its mission, to provide additional services for refuge visitors, and to assist the refuge staff in designated activities (H.18).

1999-

A "public" drive was created on our server computer to serve as a storage area for files that are accessible by all computers at the Brigantine Division (Section I.6).

The Lily Lake dam rehabilitation project commenced in June, 1999. The project calls for removing all woody vegetation, rebuilding and reshaping the dike, and installing a water control structure including a weir, a gate with heavy duty steel flash boards, and a screw gate (Section I.2).

Brigantine Division's computer system was networked. A desktop computer operated as our server. Also, all refuge staff had access to a computer and had email accounts. Several printers were available through the network to all staff in the Brigantine Division building (Section I.6).

B. CLIMATIC CONDITIONS

Climatological data for the Edwin B. Forsythe NWR was gathered from a National Oceanic and Atmospheric Administration Station located at Atlantic City International Airport. Although this station is located 7 miles inland from the Brigantine Division headquarters, it is the closest official weather station. With the refuge stretching over 50 miles of coast, climatic conditions vary and no one location can accurately record conditions for the entire refuge. The refuge's annual climatological data for 1994-99 is presented in Table 1.

U.S. Department of Commerce National Oceanic & Atmospheric Administration

TABLE 1. ANNUAL **CLIMATOLOGICAL SUMMARY** (1994)

National Climatic Data Center Federal Building 151 Patton Avenue Asheville, North Carolina 28801

Station: 280311/93730, ATLANTIC CITY INTL AP, New Jersey

Elev. 60 ft. above sea level

Lat. 39°°27'N, Lon. 74°°34'W

Date	Tem	peratu	re (°°	F)												Prec	ipitat	ion (i	nch	es)					
Elem->	MMXT	MMNT	MNTM	DPNT	HTDD	CLDD	EMXT	EM	INP		DT90)DX	(32D	T32 DT	00	TPCPI	PNP	EMXP	T	SNW M	XSD	D	P01 DF	205 DI	210
1994 Month	Mean Max.	Mean Min.		from	g	g e Degree		igh Lo	west	Low Date	Num	ber c	of Da	ys		f		Greatest Observe		now, Slee	t	N	umber	of Day	ys
														lin Mi =32 <=0				Day I	Oate T F			4ax ≥ Oate	=:.10>=	=.50>=	=1.0
	1 37.	0 18.	1 27.6	-3.	3 1150) () 56	28	- ;	3 19	9	0	8	29	1	4.13	0.67	0.96	28	0.5	1	1	10	3	0
	2 42.	1 21.	1 31.6	-1.	4 93:	2 (67	21	4	9 .	3	0	5	26	0	3.54	0.48	1.16	23	4.4	2	12	6	3	2
	3 50.	8 31.2	2 41.0	-0.	5 73:	5 () 77	24	1	7	1	0	0	19	0	9.25	5.63	1.71	28	0.2	ОТ	31	12	7	4
	4 66.	9 43.	55.0) 5.	0 30	7 18	89	25	2	7 8	8	0	0	4	0	2.03	-1.53	1.08	13	0.0	0		6	i	l
	5 69.	7 45.0	57.4	-3.	0 250	0 22	2 87	23	32	2 14	4	0	0	1	0	3.48	0.15	0.61	18	0.0	0		10	3	0
	6 83.	7 61.	1 72.4	3.	0 1	4 245	96	19	40	2 :	3	6	0	0	0	0.71	-1.93	0.24	8	0.0T	0T	30	3	0	0
	7 87.	0 68.	1 77.6	5 2.	9 (398	96	9	5.	5 13	2	7	0	0	0	4.11	0.28	1.43	18	0.0	0		7	3	2
	8 80.	8 60.6	0 70.4	-3.	0 1:	5 189	90	14	49	9 2	4	1	0	0	0	5.37	1.23	2.00	14	0.0	0		9	3	1
	9 75.	9 52.6	6 64.3	3 -1.	8 7.	3 60	89	14	4	2 1	1	0	0	0	0	3.78	0.85	2.41	22	0.0	0		4	2	1
1	0 66.	4 39.9	9 53.2	2 -1.	7 35	9 (76	30	29	9 28	8	0	0	3	0	0.82	-2.00	0.69	23	0.0	0		1	1	0
1	1 60.	8 38.2	2 49.5	3.	7 45	8 (75	9	20) 24	4	0	0	10	0	3.09	-0.49	0.84	27	T0.0	OT	30	7	2	0
1	2 51.	4 29.4	4 40.4	1 4.	6 75:	5 () 66	7	14	4 3	1	0	0	21	0	2.18	-1.14	0.94	10	0.0	0		4	2	0

13 113

1 42.49

5.1

2 Feb

96 Jul





National Climatic Data Center Federal Building 151 Patton Avenue Asheville, North Carolina 28801

Station: 280311/93730, ATLANTIC CITY INTL AP, New Jersey

Elev. 60 ft. above sea level

Lat. 39°°27'N, Lon. 74°°34'W

DateTemperature (°° F)

Elem->N	MMXT	MMNT	MNTM	DPNT	HTDD	CLDD	EMXT	EMNI)	D	T90 D	X32D	T32 DT	T 00	PCPD	PNP	EMXP	T	SNW	MXSD	Đ	P01 DI	905 DI	210
1995 Month N		Mean Min.			Degree	Cooling Degree Days	Highes Hig t Dat			.ow N Date	umber	of Da	ıys	Т	fr		Greates Observe		now, S	Sleet	N	umber	of Day	· S
											=9() <=	=32 <	lin Mi =32 <= • •				Day	Date T F		Max M Depth L		=.1()>=	=.5()>=	:1.0
1	46.	2 29.4	4 37.8	8 6.9	9 835	5 ()	67	14	11	5	0	1	20	0	2.85	-0.61	0.81	20	T0.0	0T	31	6	3	0
2	41.	5 21.	7 31.6	5 -1.4	4 929	9 ()	58	19	6	6	0	7	23	0	1.84	-1.22	0.81	4	0.8	OT	28	5	1	()
3	54.	2 32.6	0 43.1	1 1.0	6 674	4 0	72	17	18	11	0	0	16	0	0.93	-2.69	0.50	8	0.0	0		2	1	0
4	61.	4 37.	7 49.6	5 -0.4	4 450	5 1	80	22	21	5	0	0	10	0	2.17	-1.39	0.60	30	0.0	0		4	2	0
5	71.	3 48.0	0 59.3	7 -0.7	7 185	5 28	84	24	34	9	0	0	0	0	4.82	1.49	1.44	10	0.0	0		7	3	2
6	77.	8 58.3	8 68.3	3 -1.1	1 14	4 122	90	20	47	16	1	0	0	0	3.11	0.47	7 1.18	7	0.0	0		7	2	1
7	87.	7 66.	2 77.0	0 2.3	3 (379	100	15	53	10	13	0	0	0	2.07	-1.76	0.65	7	0.0	0		5	1	0
8	85.	2 61.	6 73.4	4 0.0	0	1 271	98	4	48	26	8	0	0	0	3.24	-().9() 2.95	6	0.0	0		2	1	1
9	76.	9 56.	0 66.;	5 0.4	4 50	001	93	1	44	12	1	0	0	0	3.89	0.96	5 2.17	17	0.0	0		4	2	2
10	70.	5 47.	0 58.8	8 3.9	9 223	3 41	84	6	34	30	0	0	0	0	5.16	2.34	1.32	5	0.0	0		8	4	2
11	51.	1 31,	9 41.:	5 -4.3	3 702	2 4	76	3	20	17	0	0	18	0	4.12	0.54	1.18	11	0.0	0		7	3	2
12	40.	5 23.	2 31.9	9 -3.9	9 1020	0 (57	3	12	11	0	7	29	0	1.49	-1.83	0.47	16	0.0X	0		4	0	0
Annual	63.	7 42.	8 53.3	3 0.3	3 5089	9 946	100	Jul	6	Feb	23	15	116	0	35.69	-4.60	2.95	Aug	0.8X	0	Feb	61	23	10



U.S. Department of Commerce
National Oceanic & Atmospheric Administration

ANNUAL

ANNUAL CLIMATOLOGICAL SUMMARY (1996)

National Climatic Data Center Federal Building 151 Patton Avenue Asheville, North Carolina 28801

Station: 280311/93730, ATLANTIC CITY INTL AP, New Jersey

Elev. 60 ft. above sea level

Lat. 39°°27'N, Lon. 74°°34'W

DateTemperature ((°° F)
-------------------	--------

Elem->Ml	MXT M	MNT MI	NTM D	PNT F	ITDD C	LDD EN	MXT	E	MNP		DT9	0 DX:	32 DT	32 DT0	00 1	PCPE	PNP E	MXP	τ	SNWN	4XSD	DP01 DI	205 DI	210
1996 Mo Month Ma			fr	rom g Iorma I	Ieatin C g Degree D Days D	cgree	h	~	owest	Low Date	Num	nber of	Days		7	f	Depart.G rom O Norma			now, S	lect	Number	of Day	/S
											Max >=9			n Mir 32° <=0			D	ay E			Aax M Depth D	ax >=.10>= ate	=.50>=	:1.()
1	40.5	22.0	31.3	0.4	1038	0	60	18		7 1	1	0	6	26	0	3.59	0.13	1.10	27	0.0X	0	6	3	1
2	41.8	24.6	33.2	0.2	917	0	67	25	-:	8	5	0	10	18	3	2.05	-1.01	0.61	16	M	М	7	1	0
3	46.8	26.4	36.6	-4.9	872	0	63	5		7 1	0	0	2	24	0	3.65	0.03	0.77	6	М	M	8	3	0
4	60.8	41.5	51.2	1.2	412	7	81	21	3	1 1	5	0	0	4	0	4.45	0.89	1.38	1	М	M	8	3	2
5	68.6	49.3	59.0	-1.4	238	58	96	20	3.	3 1	4	3	0	0	0	4.51	1.18	0.94	21	М	M	12	4	0
6	80.3	61.4	70.9	1.5	19	200	92	15	4.	3	2	l	0	0	0	3.94	1.30	2.29	19	М	M	4	3	1
7	81.7	64.2	73.0	-1.7	0	252	90	18	5.	5 2	1	2	0	0	0	4.63	0.80	1.85	13	M	М	9	2	1
8	81.4	62.1	71.8	-1.6	0	215	89	23	5	6	8	0	0	0	0	4.31	0.17	2.15	13	М	M	7	3	1
9	77.4	58.1	67.8	1.7	46	136	91	10	4	5 2	4	1	0	0	0	5.82	2.89	2.11	17	М	M	8	4	2
10	65.3	43.7	54.5	-0.4	318	1	81	17	3.	2 1	2	0	0	1	0	5.03	2.21	1.97	19	М	М	5	2	2
11	49.9	30.3	40.1	-5.7	738	0	71	7	1	5 2	8	0	1	21	0	1.38	-2.20	0.43	26	М	М	4	0	0
12	47.8	31.6	39.7	3.9	776	0	58	2	1	5 2	.2	()	l	20	0	7.10	3.78	1.28	13	M	М	10	7	3
Annual	61.9	42.9	52.4	-0.6	5374	869	96	May	-	8 Fe	:b	7	20	114	3	50.46	10.17	2.29	Jun	М	М	88	35	13



ANNUAL CLIMATOLOGICAL SUMMARY (1997)

National Climatic Data Center Federal Building 151 Patton Avenue Asheville, North Carolina 28801

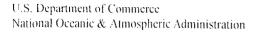
Station: 280311/93730, ATLANTIC CITY INTL AP, New Jersey

Elev. 60 ft. above sea level

Lat. 39°°27'N, Lon. 74°°34'W

DateTemperature	(°°	F)
-----------------	-----	----

Elem->Ml	MXT M	MNT M	NTM D	PNT H	TDD CI	JDD EM	XT	EN	ANP	D'	190 D2	X32D	T32 DT0	0 TPCPE	PNP E	EMXP	TSNV	V MXSD	DP01 D	P05 DF	210
1997 Mo Month Ma			fr		egree Do	ooling Higl egree ays		igh Lo		.ow Ni Date	ımber o	f Day	S		-	Greatest Observe		. Slect	Number	of Day	/8
										M >= 0		32 <	lin Min =32 <=0		I	Day - E	Date Total Fall	Max Depth	Max >=.10>: Date	=.5()>=	0.1
1	41.5	23.2	32.4	1.5	1007	0	61	3	2	19	0	7	26	0 2.76	-0.70	0.82	16		5	2	θ
2	48.9	29.7	39.3	6.3	714	0	73	27	17	10	0	0	20	0 3.09	0.03	1.00	14		6	2	1
3	52.7	31.4	42.1	0.6	703	0	72	2	17	17	0	0	19	0 5.33	1.71	1.28	3		9	6	2
4	60,0	37.6	48.8	-1.2	479	()	74	7	23	10	0	0	8	0 4.31	0.75	1.30	28		8	3	1
5	69.0	46.0	57.5	-2.9	236	12	91	19	32	8	1	0	ı	0 2.69	-0.64	1.17	25		8	1	1
6	79.0	56.0	67.5	-1.9	94	178	96	25	41	9	5	0	0	0 2.20	-0.44	0.54	13		6	1	0
7	85.3	64.4	74.9	0.2	I	315	98	15	55	31	10	0	0	0 5.89	2.06	2.77	24		6	4	1
8	81.3	61.8	71.6	-1.8	0	211	96	16	54	24	2	0	0	04.96X	М	2.40	21		5	3	2
9	75.7	54.6	65.2	-0.9	79	91	86	20	38	22	0	0	0	0 1.55	-1.38	0.80	28		2	2	0
10	65.8	42.6	54.2	-0.7	346	19	87	6	27	23	0	0	7	0 2.67	-0.15	0.79	25		6	2	0
11	52.0	34.1	43.1	-2.7	652	0	63	3	20	25	0	0	13	0 4.54	0.96	0.75	1		9	4	0
12	46.2	27.8	37.0	1.2	860	0	60	16	16	15	0	0	25	0 4.25	0.93	1.76	29		8	2	1
Annual	63.1	42.4	52.8	-0.2	5171	826	98	Jul	2	Jan	18	7	119	0 44.24 X	М	2.77	Jul		78	32	9



ANNUAL CLIMATOLOGICAL SUMMARY (1998)

National Climatic Data Center Federal Building 151 Patton Avenue Asheville, North Carolina 28801

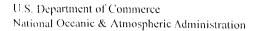
Station: 280311/93730, ATLANTIC CITY INTL AP, New Jersey

Elev. 60 ft. above sea level

Lat. 39°°27'N, Lon. 74°°34'W

Date Temperature	(°°	F)	
------------------	-----	----	--

E	lem-≥M	MXT M	IMNT N	ANTM	DPNT	HTDD (CLDD	EMXT		ЕМ	ΝP	D'	F90 DX	(32D)	T32 DT	00 T	PCPI	2 OPNP	EMXP	TSN'	W MXSE	DP01	DP05	DP10	
	998 Me Ionth M		1ean N Iin.			Heating O Degree I Days I		Highes	t High Date			ow Nu ate	ımber (of Da	ys	Т	f	Depart. From Normal	Greate Observ		, Sleet	Numb	er of I	Days	
													9() <=-		in Mir =32 <=0				Day	Date Total Fall	Max Depth	Max >=.10 Date	>=.50	>=1.0	
	1	48.7	31.8	40.3	9.4	4 757	•	0 6	6	4	14	1	0	1	20	0	5.78	2.32	2 2.09	23		7	3	2	
	2	48.6	31.7	40.2	2 7.2	2 688	•	0 6	2 1	8	16	16	0	0	15	0	4.89	1.83	3 2.3	7 23		7	3	1	
	3	53.2	35.3	44.3	3 2.8	652	1	7 8	7 3	30	16	13	0	0	13	0	6.49	2.87	7 1.14	1 21		8	6	3	
	4	63.2	42.0	52.6	5 2.6	364	(0 7	6	2	29	13	0	0	3	0	3.27	-0.29	0.84	1 23		(2	0	
	5	72.4	53.1	62.8	3 2.4	140	71	9 9	1 1	9	38	15	1	0	0	0	6.68	3.35	5 2.03	3 9		8	5	2	
	6	79.1	60.2	69.7	7 0.3	3 28	17:	5 9	4 2	26	47	6	2	0	0	0	2.77	0.13	3 1.20) 12		Ś	2	1	
	7	85.6	64.8	75.2	2 0.5	5 0	32:	5 9	8 2	22	55	11	6	0	0	0	1.40	-2.43	0.5	17		4	1	0	
	8	85.5	64.5	75.0) 1.6	5 0	310	6 9	6 2	25	51	20	6	0	0	0	1.77	-2.37	7 0.59	18		3	2	0	
	9	80.5	58.0	69.3	3.2	2 36	17	1 9	3 2	.7	40	24	3	0	0	0	0.49	-2.44	0.22	2 4		2	. 0	0	
	10	67.3	44.9	56.1	1.2	2 270	;	5 8	4	1	33	23	0	0	0	0	3.10	0.28	3 1.68	3 8		4	. 3	1	
	11	57.2	33.7	45.5	5 -0.3	3 579	(0 7	1 2	!9	23	5	0	()	12	0	1.26	-2.32	0.59) 11		3	2	0	
	12	49.6	30.2	39.9	9 4.1	770	(0 7	7	7	8	26	0	4	20	0	2.02	-1.30	0.5	1 13		7	' I	0	
Α	nnual	65.9	45.9	55.9	2.9	4284	1088	8 9	8 J	al	8 E	Эес	18	5	83	0.3	9.92	-0.37	7 2.37	7 Feb		6-	. 30	10	



ANNUAL CLIMATOLOGICAL SUMMARY (1999)

National Climatic Data Center Federal Building 151 Patton Avenue Asheville. North Carolina 28801

Station: 280311/93730, ATLANTIC CITY INTL AP, New Jersey

Elev. 60 ft. above sea level

Lat. 39°°27'N, Lon. 74°°34'W

Date Temperature	(°°	F)
------------------	-----	----

																1	,		/				
Elem-	>MMXT	MMNT	MNTM	DPNT	HTDD	CLDD	EMXT		EMNP		DT90 DX	K321	DT32 DT	T 00	ГРСРІ	DPNP	EMXP	TSN	W MXSI	DP0	l DP	05 D	P10
1999 Month		Mean Min.	Mean	from	Heating Degree Days	Degree	Highest	High Date	LowestLo D	ow ate	Number	of D	ays	Т	1	Depart. from Normal	Greates Observ		w, Sleet	Num	ber (of Da	ys
												32 <	Min Min =32 <=(o o				Day	Date Tota Fall	d Max Depth	Max >=.1 Date)>=	.50>≈	0.1
	1 46.	0 25.6	35.8	3 4.9	890	5 (6	4 23	3 6	6	0	3	24	0	5.78	2.32	2 1.32	24			8	5	3
	2 46	5 25.8	36.2	2 3.2	2 799) (6:	2 12	2 10	23	0	2	22	0	2.88	-0.18	0.81	18			7	3	0
-	3 51.	7 30.0	40.9	-0.6	741	Ι (7-	4 18	8 16	9	0	0	19	0	4.56	0.94	1.50	14			9	3	1
L	4 61.	9 38.5	50.2	2 0.2	2 437	7 (8	1 8	8 30	6	0	0	5	0	3.22	-0.34	0.93	9		1	0	2	0
	5 71.	4 49.7	60.6	0.2	2 160) 3() 90	0 31	1 36	1	1	0	0	0	1.45	-1.88	0.41	24			4	0	0
(6 80.	4 59.5	70.6	0.6	5 23	3 180	9	8 8	8 47	6	4	0	0	0	2.84	0.20	1.88	20			3	1	1
•	7 89.	2 68.0	78.6	3.9) () 43() 9'	9 (5 54	12	19	0	0	0	1.68	-2.15	0.70	13			3	2	0
8	8 83.	7 64.9	74.3	0.9) 2	2 301	I 9	7 1	1 55	23	5	0	0	0	6.28	2.14	2.82	20			4	3	2
Ç	9 76.	6 59.5	68.1	2.0) 33	3 131	8:	5 8	8 46	23	0	0	0	0	4.91	1.98	2.43	16			7	4	1
10	66.3	2 42.9	54.6	-0.3	322	2 6	5 80	0 3	3 32	15	0	0	1	0	3.45	0.63	1.12	17			6	3	1
1	1 59.	9 39.8	49.9	4.1	448	3 1	! 70	5 10) 22	18	0	0	9	0	1.46	-2.12	0.64	25			3	2	0
13	2 49.0	0 30.1	39.6	3.8	782	2 0) 6:	5 5	5 12	25	0	2	20	0	2.75	-0.57	1.05	14			5	2	I
Annua	1 65.3	2 44.5	54.9	1.9	4643	1079	99) Ju	l 6	Jan	29	7	100	0 4	41.26	0.97	2.82	Aug		6	9	30	10

Notes

(blank)Not	reported.

- X Monthly means or totals based on incomplete time series. 1 to 9 days are missing. Annual means or totals include one or more months which had 1 to 9 days that were missing.
- + Occurred on one or more previous dates during the month. The date in the Date field is the last day of occurrence. Used through December 1983 only.
- M Used to indicate data element missing.
- A Accumulated amount. This value is a total that may include data from a previous month or months or year (for annual value).
- T Trace of precipitation, snowfall, or snowdepth. The precipitation data value will = zero.
- on proportional available data across the entire month.
- B Adjusted Total. Monthly value totals based Elem->Element Types are included to provide cross-reference for users of the NCDC CDO System.
- EAn estimated monthly or annual total.
- StationStation is identified by: CoopID/WBAN. Station Name, State.

S Precipitation amount is continuing to be accumulated. Total will be included in a subsequent monthly or yearly value. Example: Days 1-20 had 1.35 inches of precipitation, then a period of accumulation began. The element TPCP would then be 00135S and the total accumulated amount value appears in a subsequent monthly value. If TPCP = "M" there was no precipitation measured during the month. Flag is set to "S" and the total accumulated amount appears in a subsequent monthly value.

C. LANDS ACQUISITION

1. Fee Title

The Service acquired 12, 19 and 15 tracts at the Brigantine Division, the Barnegat Division and the Reedy Creek Unit during 1994-99 adding 471.085, 1,355.354 and 1,056.603 acres, respectively (Table 2).

Table 2. Sur	Table 2. Summary of 1994-99 Land Acquisitions at the E.B. Forsythe NWR.							
Division	Tract #	Cost	Acreage	Date Acquired				
Brigantine	1063	\$40,000.00	4.0	2/18/94				
Brigantine	715d	\$225,000.00	9.67	3/30/04				
Brigantine	1235, -I, -II, a, -I	\$21,000.00	36.14	12/22/94				
Brigantine	1236	\$597,674.50	41.31	5/3/95				
Brigantine	1231	\$230,000.00	5.17	9/28/95				
Brigantine	1120a, -h, -k	\$274,200.00	132.78	1/30/96				
Brigantine	1240	\$187,000.00	16.05	6/26/96				
Brigantine	1076, -I, -II, _III, -IV	\$190,000.00	179.5	7/3/96				
Brigantine	704, a	\$10,500.00	20.7 (+/-)	2/19/97				
Brigantine	1164	\$1.00	0.23	2/18/98				
Brigantine	2001 Ar	\$300,000.00	23.398	6/8/98				
Brigantine 1239		\$36,000.00	2.11	8/2/98				
SUBTOTALS	-	\$2,111,375.5	471.085	-				
Barnegat	812, -III, R	\$460,000.00	36.56	5/3/94				
Barnegat	2001Ab, -I, -II, -III, -IV	\$180,000.00	128.7	9/27/94				
Barnegat	2001 AdI	\$1,700,000.00	206.7	10/26/94				
Barnegat	2001Ag	\$1,330,000.00	66.67	5/23/95				
Barnegat	2001Af, -I	\$600,000.00	235.2	6/22/95				
Barnegat	2001AeI. Ah	\$300,000.00	54.94	7/18/95				

Table 2. Su	mmary of 1994-99 Land Acqui	sitions at the E.B.	Forsythe N	WR.	
Barnegat	211, -I, -II, -III, -IV, -V, -VI, -VII, -VII, -IX, -X	\$103.830.00	102.784	7/31/95	
Barnegat	905, a	\$25,000.00	36.19	4/11/96	
Barnegat	850s	\$26,000.00	36.0	5/16/96	
Barnegat	850 h-k, m, n, p-r	\$107,300.00	144.8	11/25/96	
Barnegat	5001	\$10,500.00	10.28	-11/26/96	
Barnegat	909	\$6,000.00	7.0	2/13/97	
Barnegat	2001 Ak	\$1.050,000.00	106.86	4/2/97	
Barnegat	Barnegat 1345		7.97	5/5/97	
Barnegat	2001 Am	\$115,000.00	63	7/18/97	
Barnegat	976, a, b	\$13,500.00	17.37	9/5/97	
Barnegat	2001 Aq	\$1,551,467.50	89.92	1/5/98	
Barnegat	1451	\$650.00	0.34	7/28/98	
Barnegat	2077	\$157,000.00	4.07	12/8/99	
SURFOTALS	-	\$7,743,247.50	1,355.35 4	-	
Reedy Creek	2302	\$65,000.00	0.50	5/3/94	
Reedy Creek	2001y	\$209,500.00	4.57	5/5/94	
Reedy Creek	2001Aa	\$400,000.00	14.88	10/14/94	
Reedy Creek	2001Ac	\$158,000.00	328.04	12/22/94	
Reedy Creek	2000, -I	\$1.00	30.898	10/8/96	
Reedy Creek	2000a	\$1.00	2.032	10/8/96	
Reedy Creek	2000Ь	\$1.00	47.39	10/8/96	
Reedy Creek	2000c, -I, -II	\$1.00	65.82	10/8/96	

Table 2. Su	Table 2. Summary of 1994-99 Land Acquisitions at the E.B. Forsythe NWR.						
Reedy Creek	2000d, -I, -VI	\$1.00	113.55	10/8/96			
Reedy Creek	2000e1, 2, 3, 4, 5, 6, 7, 8, 9, 10	\$1.00	8.21	10/8/96			
Reedy Creek	2000f 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31	\$1.00	57.20	10/8/96			
Reedy Creek	2000g, -I	\$1.00	3.55	10/8/96			
Reedy Creek	2001 Ah	\$1.00	3.19	5/19/97			
Reedy Creek	2001 Ap	\$90,000.00	3.573	3/26/98			
Reedy Creek	2001 At	\$648,675.00	373.2	1/28/99			
SUBTOTALS	•	\$1,571,184.00	1056.603	-			
TOTALS	_	\$11,425,807.00	2883.042	-			

D. PLANNING

1. Master Planning

The Service established the Jersey Coastal Refuge Planning Team in August 1996 to develop the Comprehensive Conservation Plan and Environmental Assessment for the Edwin B. Forsythe and Cape May National Wildlife Refuges. The team included a representative from the New Jersey Division of Fish and Game.

The Service held a series of 11 Public Meetings along the Jersey Coast during the fall of 1996. Meeting were held in Lacey, Dover, Dennis, Galloway, Upper, Middle, Lower, Stafford, Brick, and Long Beach Townships and Tuckerton Borough. The locations, dates, and times for these meetings were announced in local newspapers, as well as

through special mailings. Over 280 people attended these meetings. The purpose of the Public Meetings was to let people know what the Service was doing to manage the special wildlife and habitats found in the two Jersey Coastal Refuges.

The Service prepared an Issues Workbook as a tool to help collect people's ideas, thoughts and concerns about important issues associated with managing the Jersey Coast Refuges. Copies were mailed to people on our mailing list and given to everyone who attends the public meetings. Copies were also sent to anyone who requested one. People were asked to read through the workbook and jot down their thoughts on the issues and action options listed. The people were also asked to respond to a series of questions on:1) the things they valued most about the Jersey Coast, 2) their vision for the future, and 3) the Service's role in helping to protect, conserve and enhance fish and wildlife and their habitats along the Jersey Coast. Nearly 1,000 copies of the workbook were distributed, and more than 150 copies were completed and returned.

In early April 1997, the Regional Office sent invitations to 82 individuals and groups to attend one of three alternative workshops, one each in Ocean County, Cape May County, and Atlantic County. The purpose of the workshop was to develop alternatives to address issues raised during the public meeting held in 1996. The workshops were scheduled for April 22, 23, and 24, 1997, respectively. Those invited included: county and local elected officials, chambers of commerce, county planners, recreational user groups, non-profit conservation groups, and State agencies. Because of the low response, the Service held only one alternatives workshop in Atlantic County on April 24.

In June 1999, the Service released the draft Comprehensive Conservation Plan and Environmental Assessment for 45-days of public review and comment. During July 1999, the Service held three public hearings on the draft, one each in Cape May County, Atlantic County and Ocean County. Over 170 people attended the three public hearings. The Service received over 1,600 individual comment letters. Most of the comments responded to the Service's proposal to stop motor vehicle use in the Holgate portion of the Brigantine Wilderness. Because that item had not been discussed during the 11 public hearings or during the alternatives workshop, the Service subsequently decided to issue a revised draft.

5. Research and Investigations

Forsythe NR94-99 - "Monitoring Site for the Interagency Monitoring of Protected Visual Environments Network"

Since 1991, Forsythe NWR has participated as a visibility monitoring site for the Interagency Monitoring of Protected Visual Environments (IMPROVE) Network. Forsythe is among a network of sites (Parks, Forests, Refuges) being sampled. The purpose of the monitoring is to identify the extent of visibility impairment in Class I areas, the composition of the air pollution causing the impairment, and the sources of the air pollution. The monitoring program is funded by the U.S. Environmental Protection Agency's (EPA) visibility monitoring program. Refuge staff assist the project by changing filter cassettes in the sampler each week. An IMPROVE automatic camera system had been installed at the Brigantine HQ area by Air Resource Specialists Inc. The camera functioned to monitor visual air quality over the Brigantine Wilderness Area. Three still pictures were taken daily at regular intervals year round until 1999. The camera was reported stolen March 11, 1999. The camera was not replaced, due to funding shortfalls. Subsequently, the camera timer was returned.

Forsythe NR94-99 - "Air Quality Monitoring for Implementation of the Clean Air Act"

The NJDEP's Bureau of Air Pollution Control installed, under SUP 78-BR-9, a permanent continuous air monitoring shelter on the refuge at the Nacote Creek Research Station. The pollutants monitored at this station are sulfur dioxide (SO₂) and ozone (O₃). This station, combined with others located throughout New Jersey, provides a comprehensive program geared toward documenting the air quality in New Jersey. Sulfur dioxide has not exceeded standards in eighteen years. The air quality for ozone (commonly known as smog), however, has occasionally reached unhealthy standards at the Nacote Creek site.

Forsythe NR94-99 - "Brigantine Division Insect Fauna Study"

In 1994, William J. Cromartie, Environmental Studies Department, Stockton State College, was issued SUP #63484 to conduct a study of production and density of aquatic insect fauna in the West Pool of the Brigantine Division. After sub-impoundment construction, he also intended to compare seasonal production and density within the two sub-impoundments (NW and SW Pools). He also intended to document changes in the substrate (and other environmental factors) that influence invertebrate populations.

Forsythe NR94-99 - "Seasonal Patterns and Settlement of Winter Flounder"

During 1992-94, Ken Able of Rutgers University's Marine Field Station, conducted a study on winter flounder that utilize the Holgate Cove during the spring and early summer. Because of the proximity of the cove and the sampling times involved, piping plovers, least terns and black skimmers were not affected by the study. The purpose for the study was to determine seasonal patterns of settlement of winter flounder, microhabitat distribution patterns for young of the year and predator-prey interactions, habitat-specific growth for young flounder of the year, and juvenile dispersal patterns for flounders in Holgate Cove. Due to lack of manpower and time, all of the objectives of the permit were not addressed. Compared to results of 1992-93, it appeared that densities of winter flounder in Holgate Cove during 1994 were decreasing. In 1995, plans included intensified efforts to compare Holgate Cove with other portions of the estuary and attempt to elucidate the mechanism of such variation.

Because of changing research priorities in 1994, Holgate Cove was only sampled twice (Table 3).

Table 3.	. Summary o	of winter flou	nder sample o	eatch parame	eters for Ho	lgate Cove,
Date	# of 10-sec. Tows	# Fish Caught	Mean Fish Length (mm)	Size Range	Temp. (°C)	Salinity (ppt)
6-7-94	4	6	36.7	23.0-53.1	17	29
6-8-94	_5	8	34.8	23.9-53.8	18.1	29

Forsythe NR94-99 - "Movement and Habitat Use of Greater Snow Geese on the Delmarva Peninsula"

A research project was submitted in 1992 for a three-year radio telemetry study on migrating snow geese between 1993-96. The project was to focus on snow goose movement among refuges and wildlife management areas in New Jersey, Delaware, Maryland, and Virginia. Another objective was to examine the effects of the Canada goose and greater snow goose hunting seasons on movement of greater snow geese in the abovementioned states. Sample geese for the project were top be leg- and radio-banded at several east coast locations, including Forsythe's Brigantine Division. This project was never implemented at Forsythe NWR.

Foraging Patterns and Nestling Salt Tolerance"

Jerald Dosch of Rutgers University conducted this research on the Forsythe NWR - Brigantine Division from 13 May - 25 August 1994 under SUP # 63478. He investigated the role of dietary salt intake on growth of young by examining foods brought to them by parents and by providing salt supplements to nestlings.

Laughing gulls breeding on coastal salt marshes of New Jersey travel up to 40 km to forage at inland foraging areas (IFA). Adult laughing gull foraging patterns and colony site selection may be influenced by the limited physiological ability of the nestlings to develop optimally on a high salt content diet. Laughing gulls breeding on Egg Island traveled relatively long distances to access foraging areas, and these gulls fed at IFAs on a regular basis. Adult gulls fed their nestlings food of inland origin. In fact use of IFA's was greatest when dependent young were in the nest (after egg hatch but before fledging).

The growth of nestlings was slowed by dietary salt supplements, indicating the value of obtaining food items of inland origin. Colony distribution may well be influenced by the availability of foraging sites that provide food sources low in salt.

Forsythe NR94-99 - "Evaluation of Ambient Ozone Injury on the Foliage of Vegetation in the Edwin B. Forsythe National Wildlife Refuge"

Donald Davis. PhD surveyed the Forsythe NWR - Brigantine Division from 1993-96 to monitor foliar injury induced by ambient ozone in this designated Class I air quality area. Vegetation along open areas (such as on trails, edges of large fields, or in scattered forest openings) where sensitive plants were found in full sunlight and exposed to unrestricted air movements were evaluated. In recent years, ozone levels have been at levels considered phytotoxic to sensitive species of vegetation.

In 1999, we delivered a sample of 30 Saltmarsh cordgrass (*Spartina alterniflora*) plants, with attached rhizomes, to Dr. Davis to conduct a fumigation study to evaluate *Spartina* sensitivity to ozone at concentrations found at eastern refuges. Three plants from each of 10 sub-locations were harvested and delivered.

E. ADMINISTRATION

1. Personnel

David Beall, Project Leader, GM-0485-13, PFT, transferred to Long Island Complex 1994.

Jeff King, Refuge Operations Specialist (Barnegat Division), GS-0485-11. PFT. EOD 10/11/98, transferred to Central Mississippi NWR Complex.

Brian McNamee, Americorp Group Leader, GS-0186-07, Term FT, EOD 4/26/98, resigned 12/3/99.

Scott Iozzo, Americorp Group Leader, GS-0186-07, Term FT, EOD 1/25/98, resigned 4/24/98.

Brian Willard, Park Ranger, GS-025-05, PFT, EOD 07/03/97.

Kelly D. Hogan, Refuge Operations Specialist, GS-0485-09, PFT, EOD 8/2/98, transferred to Lacassine NWR.

Cindy Heffley, Office Automation Assistant, GS-0326-4, PFT, EOD 8/15/99.

Paul Steblein, Wildlife Biologist, GS-0486-12, PFT, EOD 6/8/97.

Amy Jones, Student Career Experience Program Trainee, GS-0499-5, PFT, EOD 5/9/99.

Allison Banks, Refuge Operations Specialist (Barnegat Division), GS-0485-09, PFT, EOD 01/08/93, transferred to Region 6 RO in 1997.

Calvin "Jay" Angelow, Maintenance Worker, WG-4749-7, PFT, retired 4/30/99.

Stephen P. Atzert. Project Leader, GS-0485-13, PFT, EOD 05-15-95.

Tracy A. Casselman, Refuge Operations Specialist, GS-0485-11, PFT.

Gormley, Kevin A; Refuge Law Enforcement Officer (Barnegat Division), GS-1802-8, PFT.

Martha Hand, Office Assistant, GS-0303-6, PFT.

Thomas W. Holdsworth, Maintenance Worker, WG-4749-8, PFT.

Sandra L. Perchetti, Office Automation Clerk, GS-0326-4, PFT, EOD 1/8/95.

Linda R. Rubenstein, Outdoor Recreation Planner, GS-0023-9, PFT.

Vincent V. Turner, Wildlife Biologist (Barnegat Diviaion), GS-0486-9, PFT.

Maura Sheehan, Refuge Operations Specialist, GS-0485-9, PFT, transferred to Cape May NWR 4/3/94.

Temporaries

Jonathan Long, Refuge Law Enforcement Officer, GS-1802-5, 05/15/94 to 08/27/94.

Luke Brackett, Refuge Law Enforcement Officer, GS-1802-5, 05/14/95 to 09/30/95.

Gregory Gates, Biological Technician, GS-0404-5, 10/2/94 to 01/29/95.

Stephen Hockley, Refuge Law Enforcement Officer, GS-1802-5, 10/30/94 to 06/24/95.

Gary Murphy, Engineering Equipment Operator, WG-5716-8, 09/05/94 to 02/04/95.

Angela Prichard, Lead Park Ranger, GS-0025-3, 05/01/94 to 02/04/95.

Karen Barchi, Park Ranger (Fee Collector), GS-0025-3, Temporary-Intermittent, 4/5/93 to 4/4/94.

Brian Willard, Refuge Law Enforcement Officer, GS-1802-4, TFT, 3/17/96 to 1/14/97.

Delbert Bowen, Equipment Operator, WG-5716-8, INT, 7/20/97 to 9/27/97 and 12/7/97 to 4/6/98.

David Stebbins, LE Officer, GS-1802-5, TFT, 5/24/98 to 8/28/98.

Carleen Gonder, LE Officer, GS-1802-5, TFT, 5/99 to 12/99.

From March 19, 1995 to July 14, 1995 Refuge Operation Specialist Casselman was given a temporary promotion from GS-11 to GS-12 as Refuge Manager.

Refuge Officer Kevin Gormley received a long-deserved promotion from GS-7 to GS-8 effective March 5, 1995.

Table 4 shows total permanent full-time, part-time and temporary employees, 1994-99.

Table 4. Total permanent full-time, part-time and temporary employees of the Edwin B. Forsythe NWR, 1994-99.						
YEAR	PERMANENT FULL-TIME	PERMANENT PART-TIME	TEMPORARY			
1994	11	0	5			
1995	10	0	5			
1996	11	0	2			
1997	12	0	2			
1998	14	0	2			
1999	15	0	2			

2. Youth Programs

Scouting - Cub Scouts, Boy Scouts, Brownies and Girl Scouts, spent many hours completing Scouting projects at the refuge. In 1998, an observation platform was designed and built as part of an Eagle Scout project. The platform looks out on the Barnegat impoundments and offers an opportunity to study wetlands habitat and wildlife.

Home Schoolers - The refuge received visits from individual home schoolers and groups to complete science projects.

3. Other Manpower Programs

AmeriCorps - In 1997, AmeriCorps and Forsythe NWR signed a 3-year partnership agreement. AmeriCorps members divided their time between the Forsythe Divisions and Cape May NWR.



AmeriCorps members and crew leader Brian McNamee constructing Universally accessible Leeds EcoTrail (boardwalk).

AmeriCorps accomplishments included:

- Rehabilitating and painting of the refuge auditorium to prepared it for new displays;
- Painting refuge staff offices, and the outside of the maintenance shop;
 Removing of an old billboard;
- Participating in refuge special events such as Earth Day, International Migratory Bird Day and National Wildlife Refuge Day;
- Writing and producing "At the Refuge," an endangered species puppet show, whose touring schedule would make an aspiring musician envious. AmeriCorps members performed the show at schools, Boys and Girls Clubs, nursing homes, festivals, fairs, and Montezuma, NWR, the Big E! and the Philadelphia Zoo.
- Rehabilitating a refuge house and several public use buildings and structures.
- Monitoring piping plover breeding activities.



AmeriCorps members participated in the puppet show in 1999.

4. Volunteer Program

When it became apparent that the refuge was too short-staffed to continue to conduct weekly water bird surveys, Volunteer Coordinator Rubenstein asked the Atlantic Audubon Society if it would conduct the surveys. The Society agreed. On January 31,

1995 eighteen individuals signed on as new refuge volunteers. They received their initial orientation on the task from refuge staff. Additionally, each received on-the-job training. Since March 1995, each week a team of two of these new hands have been conducting the survey, providing data to refuge staff.

In1995, a boy scout troop installed benches along both of the Brigantine Division's foot trails.

In February,1995 six volunteer peregrine falcon observers met with refuge staff -- and Kathy Clark, of the New Jersey Division of Fish, Game and Wildlife -- to prepare for the upcoming season of peregrine watch. A total of nine seasonal volunteers observed the peregrine pairs at both the Brigantine and Barnegat Divisions of the refuge, providing critical information to refuge staff. Observations began on February 23, 1995, earlier than usual, due to the fact that at the Brigantine Division great horned owls had already twice taken over the peregrine nesting box despite refuge staff intervention. Each year the observers report on the peregrines from courtship through fledgling of young. Their ongoing observations allow refuge staff to make informed decisions about necessary management for this endangered species. In 1997, the volunteer Peregrine Falcon observation effort launched on February 26.

Volunteers provided information to refuge visitors on weekends during the busy spring and fall seasons. Their help was particularly important during 1995, the first year the refuge no longer had an entrance fee collector on duty to provide that all-important refuge contact. For most refuge visitors, these volunteers are the only refuge representatives they met.

In 1995. Atlantic Audubon volunteers tore down an old unused martin house in the refuge headquarters area, and installed a new one at a more promising location. Purple martins established a new colony.

On April 8, 1995 twenty-two Atlantic Audubon volunteers conducted a cleanup along the Wildlife Drive. They filled a pickup truck with bags of cans and bottles which had become visible the recent controlled burn had cleared away the Phragmites.

On Earth Day -- April 22, 1995 -- twenty-five volunteers from Alliance for a Living Ocean picked up and removed 100 bags of trash from the refuge's Cedar Bonnet Island.

Student Conservation Association (SCA) intern Heather Green came on board in May 1995, and worked with Refuge Biologist Vinny Turner on a variety of projects. Most prominent among these was piping plover research, which she conducted during the plovers' seasonal nesting stay at the refuge's Holgate Unit. Heather Green was also the refuge's Fall SCA volunteer. She carried out a wide range of biological and public userelated activities for the refuge. Unfortunately the final days of her stay were canceled due to government shutdown of the refuge.

From 1994 through 1996, volunteers provided information to folks at the north end of the Holgate Unit during the April through August closure. The efforts of these volunteers served to greatly reduce the number of trespass problems at Holgate, as their friendly and informative presence helped to gain public support for protection of the piping plover and its habitat. During 1997 through 1999 AmeriCorps members assumed this duty.

For the second time, Forsythe Refuge joined forces with Florida Panther NWR to nominate volunteer Harvey Grundner as 1995 Volunteer of the Year in the annual contest held by the National Wildlife Refuge Foundation. Harvey volunteers for 500 hours each year at Forsythe, and then migrates south in winter to volunteer his, willing hands and multiple talents to Florida Panther.

Under the leadership of ORP, Linda Rubenstein, the volunteer program at Forsythe grew to a membership of approximately 60. All volunteers received blue, cotton USFWS Volunteer t-shirts and hats, and are given an orientation to the refuge. Volunteer activities included assisting with posting and fencing in preparing for the closure of Holgate; peregrine observations at both the Brigantine and Barnegat Divisions; weekly waterfowl counts by Atlantic Audubon and Friends of Forsythe; preparing and conducting environmental education programs for area school groups, providing visitor information services such as visitor walks and programs in the visitor center, maintaining and repairing trails, boardwalk, osprey platforms and deer hunt blinds; conducting breeding bird and piping plover surveys and banding studies; constructing and monitoring owl, bluebird and wood duck boxes; conducting studies on Phragmites and owl pellets: and planning and participating in special celebrations.

In 1999, volunteers were given the task of establishing a native wildflower garden at the refuge headquarters. They eagerly dove into the research needed to get the project off in the right direction. Under the supervision of refuge biologist, Paul Steblein, the group of 6 women and one man the group worked their magic and transformed an area full of weeds into a garden. The project is an educational tool to show others how to use native plants.



Members of the "Garden Club" [JM].

In 1999, T.R. Bear became the unofficial mascot of the Edwin B. Forsythe NWR. As our good-will ambassador, T.R. Bear made many local public appearances.



Greg Barna (a.k.a. T.R. Bear) modeling the new costume [EJ].

5. Funding

Fiscal Year	RF O&M	MMS	Sales	Fire	Total
	1260		6860	12XX	
FY94	495	323	5.0	1.0	824.0
FY95	N/A ^a	N/A	N/A	_	-
FY96	N/A	N/A	N/A	-	_
FY97	805.7	277.5	5.0	-	1088.2
FY98	889.6	187	5.0	-	1081.6
FY99	944.3	247	5.0	_	1196.3

6. Safety

No significant accidents or injuries which resulted in loss of time occurred on the refuge during 1995. No accidents involving refuge vehicles were reported during the year.

A safety inspection of both divisions took place on September 20-21, 1995. The inspection team conducted a very thorough inspection of the refuge facilities. Basically, nothing was left unturned and quite a few things brought up the red flags. One of them being a foot locker at the Barnegat Division which contained several bags of powdered cyanogas and cans of zinc phosphide pellets. These chemicals were used for rodent pest control and probably hadn't seen the light of day in about 10 years. A contractor removed the chemicals.

A fire drill and a unexpected evacuation of the Brigantine Division, both occurred in June 1995. The purpose of the drill was to inform refuge staff of the proper path to evacuate the building. After leaving the building, a meeting place was designated for the purpose of staff accountability. Two weeks after the drill, an alarm was called in to the Oceanville Volunteer Fire Dept. Staff members safely and properly evacuated refuge headquarters. The cause for the alarm was due to the accidental cutting of some underground phone lines, which triggered the alarm.

While the refuge is located in the hot-bed of deer tick country, no new cases of Lyme's disease were reported by refuge staff.

Formal safety training:

Biologist Turner attended a contaminants meeting at Great Swamp NWR in 1995. The meeting covered the proper storage and disposal of chemicals (from waste/used oils to toxic chemicals).

In 1996 a Defensive Driving Course was given at the Brigantine Division for all refuge staff and the staff of the ES Pleasantville Office. All participants passed.

In 1995 and 1997, the refuge staff members received CPR re-certification training. All refuge staff members passed the course.

7. Technical Assistance

In 1995 and 1997, Office Assistant Hand was detailed to the R.O. in September to assist with the end of year process.

On May 12, 1994 Biologist Turner escorted a team of technicians to Holgate to place aerial survey markers for a one-year study of beach erosion and accretion. Six markers were placed at various locations along Holgate, east of the established mature dune line.

8. Other

Sandy Perchetti attended a new employee orientation seminar at the Regional Office during the week of January 23-27, 1995.

Office Assistant Hand attended training in the Regional Office during the week of April 10-14, 1995 to learn how to enter payments directly to Denver Finance Center at the field level.

Refuge Operations Specialist Casselman attended Heavy Equipment Training from May 8 to 11, 1995.

Refuge Operations Specialist Banks attended the OTE course Introduction to Supervision from January 23-27, 1995.

RO Gormley attended the 1995 Wingbee at Patuxent from January 23-27, 1995.

Biologist Turner attended a fire behavior training course from January 22-27, 1995 at Bombay Hook NWR.

Refuge Operations Specialist Banks, RO Gormley, ORP Rubenstein, ARM Casselman, and Biologist Turner attended a Time Management Training workshop in Philadelphia on March 23 & 24, 1995.

Biologist Turner attended a *Phragmites* workshop hosted by the Delaware Estuary Program on April 18-19, 1995. The work shop focused on techniques and strategies in dealing with the control\eadication of *Phragmites* on impoundments and marshes.

Office Assistant Perchetti and Biologist Turner attended a GIS training workshop at the Regional Office in Hadley on July 18-20, 1995.

Biologist Turner attended a one day piping plover predator exclosure workshop at the Regional Office on November 28, 1995.

Seasonal officer Brian Willard attended the annual law enforcement refresher training at Eastern Shore NWR in Virginia. from April 1 to 5, 1996. Officer Willard qualified in the practical pistol course and was also re-certified to carry OC spray and the ASP baton.

RO Gormley attended the Calibre Press "Street Survival Seminar" for law enforcement Officers in Atlantic City from February 8-10, 1995.

RO Gormley successfully completed supervisory training with a private vendor on December 11, 1995.

ORP Rubenstein attended the National Watchable Wildlife Conference in Estes Park, CO. September 18 - 23, 1995

April 25, 1996 - Ron Lambertson, Cathy Short, Dale Coggleshall, Steve Atzert and Allison Banks met with the Barnegat Division staff to discuss division needs.

May 17 - June 2, 1996 - Several refuge staff members were involved in an oil spill response.

June 11, 1996 - refuge staff including Kevin Gormely, Allison Banks, Vinny Turner, Tracy Casselman, Thomas Holdsworth, and Brian Willard received ATV training through Honda Corp.

On January 10-11, 1995 ORP Rubenstein attended the New Jersey Environmental Education Conference.

In 1997, Biologist Turner attended a successional habitat workshop at Erie NWR. Training session was region wide.

In 1997. Biologist Turner attended the Refuge Management Training Academy at Charlestown, SC. Refuge Academy is an extensive A to Z training on the working of the USFWS. Held once a year. Turner was passed over four times before he was able to attend this session.

During the week of March 11, 1996 Biologist Turner attended "S-390 Fire Training" in Gettysburg, PA. The training was the part of the qualifications needed to be certified a Class 3 Burn Boss. The second part of the training was conducted at Moosehorn NWR during the week of May 5, 1996. This training involved actual burning and leading a fire crew to complete the prescribed burn. Turner successfully completed the training sessions.

On March 25, 1995 ORP Rubenstein attended the Service's Outreach Workshop.

From June 25 through 28, 1997 Biologist Turner attended a training session for the proper operation of fire pumps. Training was sponsored by the National Forest Service and was held in the White Mountains of New Hampshire. Turner successfully completed the course.

From July 25 through August 2, 1997 Biologist Turner attended a class to learn how to capture and band songbirds following the MAPS banding protocol. The training sessions

covered the methods of mist net setup, bird extraction from nets, bird identification, techniques on gathering data from birds, and properly filling out the data sheets. The class sessions were held in Wells, Maine, just down the road from Rachel Carson NWR. Turner successfully completed the training session.

From December 1 through December 5, 1997 Biologist Turner attended a Ecosystem Team Workshop in Amherst, MA. The meeting was to discuss the direction of the Ecosystem Teams, and the involvement of the team members in making the system work.

In 1998 and 1999, the refuge participated in the Richard Stockton College of New Jersey Spring & Fall Career Fairs.

F. HABITAT MANAGEMENT

1. General

Land acquisition at Forsythe NWR remained active (See Section C. Land Acquisition, subsection 1. Fee Title).

2. Wetlands

The Brigantine Division impoundments were established in the early 1950's by construction of a dike system in the coastal saltmarsh around the mouth of Doughty Creek. The total impounded area encompasses 590 ha. and includes Lily Lake (8.9 ha.), Doughty Creek (24.29 ha.), Experimental Pool (9.29 ha.), East Pool (217 ha.), Northwest Pool (226.32 ha.) and Southwest Pool (123.48 ha.).

Rehabilitation work completed in 1988 in the East Pool, and in 1989 in the West Pool, using an amphibious tractor with rotary ditcher and a channel ditcher called a cookie cutter was successful in improving water circulation in both impoundments; however, the ditches cut in 1988 and 1989 quickly filled with sediment. It was recommended that repeated ditching every 3 to 5 years would be necessary unless water flowage across the pools is improved. Even with ditching, the existing water control structures and dike systems were deemed insufficient to achieve management needs (i.e., adequate water supply, habitat diversity, and emergency drawdowns for disease control).

In 1997, the subdivision of the West Pool (329 ha.) was completed. The project consisted

on two new dikes and several new water control structures (See section I. Equipment and Facilities. Sub-section 1. New Construction). This project allowed for independent management of sub-impoundments to increase habitat diversity in managed wetlands.

The Northwest and Southwest Pools have been managed mainly as freshwater impoundments (less than 8 ppt salinity). Freshwater sources for the Northwest and Southwest Pools include drainage from Lily Lake and Doughty Creek, from precipitation, and from upland runoff.

For decades freshwater had been held in the West Pool to provide habitat diversity for waterfowl, shorebirds, and wading birds. The pool was managed to provide resting and feeding habitat during the fall and spring migrations and critical wintering habitat. During the summer, the pool provided brood habitat for waterfowl. Over the years, the forces of wind and wave action, erosion, eutrophication and siltation had seriously degraded the quality of the West Pool habitat. Shallow, stagnant water within the pool prevented drying of the unconsolidated muck on the pool bottom, and posed a bacterial hazard to birds in the summer months. Definable water channels such as Doughty Creek and former tidal ditches were virtually eliminated and the perimeter ditches nearly filled in with silt.

In 1997, several additional water control structures were installed through the Brigantine Impoundment exterior dike. One in the Northwest Pool and three in the East Pool (See section I. Equipment and Facilities, Sub-section 1. New Construction).

The East Pool (217 ha.) has been managed as a brackish impoundment (10-30 ppt salinity). Excess water from the Northwest and Southwest Pools and precipitation have been the sources of freshwater for the East Pool. Tidal water from the adjacent bays, channels and ditches may be introduced into the impoundment via water control structures. The East Pool has been managed to provide waterfowl nesting and brood-rearing habitat. The East Pool had not been adequately managed because of the lack of functional water control structures and the limited number of structures. This resulted in a reduction in management capability. Years of siltation and biomass accumulation have reduced water circulation and thus water quality in this pool as well. Before rehabilitation began in the East Pool, original tidal creeks and mosquito ditches had silted in, further limiting water management capabilities. The results included high salinities. loss of vegetation through stagnation and snow goose eat-outs, and general habitat degradation.

In 1999, Lily Lake was drained for a dam reconstruction project (See Section I. Equipment and Facilities, Sub-section 2. Rehabilitation).

Phragmites Herbicide Work -

On September 15, 1994 a private contractor was brought in to apply Rodeo herbicide in the East and West Pools as well as along the Wildlife Drive. This treatment was being applied as a pre-treatment for a planned prescribed burn in the late winter of 1995. Mixing of the solution were done on site across from the refuge HQ. Applications were applied by helicopter and the job was completed in one day.

6. Other Habitats

Holgate Unit

The Holgate Unit is a 2.5 mile barrier beach at the southern tip of Long Beach Island. Management activities include fencing and signing the area to protect nesting endangered birds and the fragile dune system from pedestrians and beach buggies. From April 1 to the first week of September, Holgate is entirely closed off to any public activity.

To maintain public compliance with the closure, a wide array of signs and an interpretive display were placed at the northern boundary informing beach goers about the closure, piping plovers, least terns, and black skimmers. To aid in the control of pedestrian access along the intertidal zone, a series of ten foot pipes were placed from the top of the berm into what would be the lowest point of water during low tide. In between each of the pipes, yellow "DO NOT ENTER" police tape is placed as a visual barrier. Though this may sound unsightly, this method has proven to be very effective in deterring pedestrians from entering into a closed area. At the south tip of Holgate, Tucker's Island continues to grow larger and provide an alternative location for landing boaters and jet skiers. Since Holgate is a designated wilderness area, when open, motorized vehicles are restricted to the area below the mean high tide line. Pedestrians are allowed to use the beach but are not permitted into the dunes which are posted the entire length of the unit.

Little Beach Island

As with most barrier beach habitats, Little Beach Island was not immune to the dynamic shifting of sand or tidal action. The north end of the island has grown almost a quarter of a mile long and about one-eighth of a mile wide in a little over two years. Wave action,

along with the loss of sand, has created a deep running channel which basically cuts the island in half. Little Beach(s) can no longer be traversed north to south without the aid of a boat. These changes, however, has proven beneficial in increasing nesting habitat for piping plover and least terns. Unlike Holgate, Little Beach is closed to all public access year round. But due to shortages in staffing and enforcement, illegal access continues to be a problem on Little Beach. Activities such as surf fishing, camping, fireworks, and the running of dogs, are the most prevalent violations observed, usually after the fact.

9. Fire Management

Bass River Wildfire -

A major wildfire occurred in Bass River Township on April 19, 1994. Though no refuge property was burned, much of the lands adjacent to the refuge was severely burned. The fire grew so intense that both sides of the Garden State Parkway had to be closed to all traffic. By early evening, the fires were under control. The only structural damage that occurred involved an abandoned boat house located on the Bass River.

Wildlife Drive Wildfire-

On October 4, 1995 Biologist Turner arrived at the Brigantine Division just as Office Assistant Hand came racing out of headquarters to answer the call of a wildfire on the wildlife drive. Turner and Hand quickly suited up and grabbed the necessary equipment needed to combat the fire. The fire was located in the fields at the northwest corner of the drive. When Turner and Hand arrived, just under 1/4 acre was burned with small creeping fires still burning on the edges. With the aid of Indian tanks and flappers, the fire was quickly extinguished. The New Jersey State Forest Fire Service also responded to the incident and provided assistance. The cause of the fire is believed to be from a cigarette thrown by a passing motorist. Motorist was never found.

Prescribed Burns-

After a three year absence, a prescribed burn of the Brigantine East and West Pools was conducted on March 14,1995 which was supervised by Biologist Turner. With new protocol required for the planning of refuge burns, Turner was required to attend a Fire Management training course in order to write the proper annual program for the proposed burn. This, along with unfavorable burning conditions, pushed the window for the burn to the last possible day. With conditions teetering within prescription, only two-thirds of

of treatments to the OMWM areas have decreased. Mosquito breeding, larval development, and adult emergence are extremely dependant on rainfall and tide patterns which make it difficult to compare the amount of pesticides sprayed to previous years. As more OMWM acreage is mechanically treated, there should be a substantial and permanent reduction in pesticide use on the refuge.

Mammalian predator trapping on Holgate provided some, but not total, relief of predator stress on piping plovers and least terns (See Section H Public Use, Sub-section 10. Trapping).

Integrated pest management activities to control *Phragmites* in wetland impoundments were conducted regularly (See Section F. Habitat Management Sub-sections 2. Wetlands [*Phragmites spraying*] and 9. Fire Management [*prescribed burns*]).

12. Wilderness and Special Areas

Holgate and Little Beach Island -

Holgate and Little Beach Island are among the refuge lands that make up the Brigantine Wilderness Area. Management of these areas are difficult due to the high number of people that use the areas in and around the wilderness, lack of law enforcement to properly post and patrol Little Beach, illegal ORV use on Holgate, illegal trespass during the plover nesting season, and the difficulty of establishing the mean high tide line along the Holgate Unit shoreline. The mean high tide line is the seaward boundary of the refuge and the wilderness area. Both locations provide important nesting habitat for the federally threatened piping plover and state endangered least tern and black skimmer. Holgate is closed to all access from April 1 through August 31. The southern tip of Holgate may be closed beyond September 1 to protect black skimmer colonies and their unfledged young. Little Beach is closed to all public access throughout the year.

G. WILDLIFE

1. Wildlife Diversity

The variety of habitat types found on the refuge, including forested upland and lowland, grassland, saltmarsh, and barrier island allow for a diversity of wildlife species. Due to its proximity to the intercostal waterway and Atlantic Ocean, the refuge is a prime location in the Atlantic Flyway for observing migrating birds.

2. Endangered and/or Threatened Species

Table 6 presents a list of endangered and threatened species which may be found on the refuge:

Table 6. Endangered and threatened species occurring on the Edwin B. Forsythe NWR.

Species	Federal	State
Least Tern (Sterna antillarum)		Е
Black Skimmer (Rynchops niger)		Е
Piping Plover (<u>Charadrius melodus</u>)	T	Е
Roseate Tern (<u>Sterna dougallii</u>)	T	Е
Bald Eagle (Haliaeetus leucocephalus)	T ^a	Е
Osprey (<u>Pandion haliaetus</u>)		Т
Am. Peregrine Falcon (Falco peregrinus anatum)	Е	Е
Ar. Peregrine Falcon (<u>Falco peregrinus tundrius</u>)	T	Е
Cooper's Hawk (<u>Accipiter cooperii</u>)		Е
Northern Harrier (<u>Circus cyaneus</u>)		E*
Red-shouldered Hawk (<u>Buteo lineatus</u>)		T/E*
Great Blue Heron (<u>Ardea herodias</u>)		T
Little Blue Heron (<u>Egretta caerulea)</u>		T*
Yellow-crowned Night Heron		
Nyctanassa violaceus)		Т
Black Rail (<u>Laterallus jamaicensis</u>)		T
Short-eared Owl (<u>Asio</u> <u>flammeus</u>)		E
Barred Owl (<u>Strix varia</u>)		T
Red-headed Woodpecker (Melanerpes erythrocephalus)		Т
Savannah Sparrow (<u>Passerculus</u> <u>sandwichensis</u>)		T
Grasshopper Sparrow (<u>Ammodramus</u> <u>savannarum</u>)		T*
American Bittern (<u>Botaurus lentiginosos</u>)		T*
ried-billed Grebe (<u>Podilymbus</u> <u>podiceps</u>)		E*
ine Barrens Treefrog (<u>Hyla andersonii</u>)		E

^{*} Only breeding population endangered or threatened

^a Down-listed from Endangered during 1995.

Holgate - Piping Plovers -

In 1994, piping plover productivity at Holgate reached a low. Of the 15 know nesting pairs found, only six plover chicks were able to reach the fledgling stage from 21 total nests (including re-nests). The productivity was 0.40 fledged chicks per nesting pair. The causes for low productivity were predator activity, flooding, and abandonment (ten, two, and two nests lost respectively). Gulls were the main predator. Many of the nests were lost before we could put nesting exclosures around the nests for protection.

Three walking surveys were conducted at Holgate for 1994. On May 5, 21 adults were observed; on June 1, 20 adults; and June 20, 25 adults and two chicks were observed. June 1, walking survey was the five year International Piping Plover Survey.

In 1995, the first plovers on the refuge were observed on April 3. Ironically, this pair arrived on the day that Holgate was to be closed for the season. The plovers appeared to be waiting for us at the northern portion of the unit as if to say "We've been waiting. What took you so long?". During the process of securing the north portion, the pair never strayed more than 50 yards from working staff members. Apparently, this pair had been through the routine before.

In 1996, total nesting pairs at Holgate were the lowest in several years with 11 pairs. They established 16 nests and produced a total of 20 observed chicks. The 20 chicks came from 6 pairs. Of those 20 chicks, 14 reached the fledging stage, for a productivity of 1.27 chicks per pair. Seven nests were lost, five to predation, two to flooding.

In 1997, there were again only 11 pairs of piping plover at Holgate. Eleven pairs created 11 known nests. Of those, four were destroyed, three by flooding and one by predation. Five pairs were successful in fledging at least one chick. Twenty-two chicks were actually observed with nine of those reach the fledging stage. Productivity for Holgate was 0.82 chicks per nesting pair.

Predator exclosures have been used in the past, but an increased effort was implemented where every nest found during laying period with two eggs or more, would receive an exclosure. Of the ten nests found, eight received exclosures. Of the two nests which didn't get exclosures, one was abandoned after the first egg was laid (which the pair renested nearby) and the other was destroyed the night before the exclosure could be erected. The exclosures proved to be very successful in which all exclosed nests did

survive to hatching. The only attempt of entrance into an exclosed nest by a predator, occurred when a slender boat-tailed grackel snatched and consumed two eggs from a four-egg nest. The two remaining eggs hatched with both chicks surviving to fledging.

Unlike other refuges, Holgate does not have the scourge of "smart predators" wreaking havoc on plovers nests within the exclosures. There is growing concern for the use of these exclosures in areas of high predator activities. Since Holgate has only extensively used exclosures for one year, it could be assumed that the smart predators haven't caught onto the correlation between the exclosures and a possible meal. Contracting work from ADC (Animal Damage Control) was aggressively conducted during 1996 with hope that any predators on Holgate will not have the opportunity to "get smart".

	Table 7. Estimated Piping Plover Nesting Success at Edwin B. Forsythe NWR - Holgate Unit, 1994-99.												
Year	Nesting Pairs	Total Nests	Successful Nests	Nests Lost	Chicks Fledged	Average Fledged/ Nesting Pair							
1994	15	21	4	14	6	0.40							
1995	12	10	7	3	7	0.58							
1996	11	16	6	7	14	1.27							
1997	11	11	5	4	9	0.82							
1998	17	26	8	13	15	0.88							
1999	24	25	11	6	20	0.83							

Little Beach - Piping Plovers -

Logistics for collecting data on Little Beach proved to be a bit trying at times. Because of lack of staffing and no interns applying for the position, Biologist Turner had to rely on the Holgate interns and a few volunteers to assist in collecting data. Since access to Little Beach is by boat only, weather also played a factor in access. There would be periods of time between observations that would be as much as two weeks! Even with such inconsistency between visits, data was collected in the most thorough manner possible.

In 1994, ten nesting pairs were observed and produced 11 nests. Unlike Holgate, nest loss was low in comparison. Only three nests were lost, two to predation, one to

flooding. However, because of the lack of visits, the fate of three other nests were not known. They likely may have hatched, but because no chicks were ever observed or the adults seen loafing around the nest area, there outcomes were unknown. A total of eight chicks were ever seen with only three of them reaching the fledgling stage for a total productivity of 0.30 chicks per nesting pair. This is the lowest productivity recorded for Little Beach since monitoring of plovers began in 1986. For improved monitoring in the upcoming years, it is apparent that additional staffing will be needed to thoroughly and accurately collect data from this location.

Only one walking survey was conducted at Little Beach and that was for only the north half of the island on June 3, 1994. A tidal cut separated Little Beach and access to the south half of the island was not possible by foot. Only 11 adults were observed on this survey with no sighting of chicks. Survey conducted was also an International Piping Plover Survey.

In 1996, thirteen nesting pairs were found on Little Beach, creating 21 total nests. Because of the difficultly in boat access (due to weather), data collection was not as frequent as that of Holgate. Of the 21 nests, only 11 chicks were ever observed. Of those 11, eight reached the fledging stage for a productivity of 0.62 chicks per nesting pair. Seventeen of the 21 discovered nests failed; 11 to predators, four to flooding, one to abandonment, and one to direct human disturbance.

In 1997, Little Beach had eight nesting pairs producing twelve known nests. Of those, nine failed to hatch, five lost to flooding, one to predation, and three to unknown disappearance. Two pairs were able to fledge young. A total of eight chicks were observed with four reaching the fledging stage. Productivity for Little Beach was 0.50 chicks per nesting pair.

Little Beach Island in 1995 was still cut into two separate islands. No longer was it possible to conduct a plover survey of the entire island without the use of a boat or walking through chest deep water with a strong current. Due to staffing shortages at the Brigantine Division, regular visits and surveys to the island was infrequent at best. Biologist Turner, along with assistance from New Jersey DEP, was able to find eleven nests from an estimated fifteen breeding pairs. Only one of the 11 nests was located on the southern half of the island. Little Beach also has a very low beach profile, which makes for some serious tidal flooding across plover nesting habitat. It is unknown how many undiscovered nests were lost due to tidal flooding. Unlike Holgate, no predator exclosures were used on Little Beach. Of the eleven nests found, successful hatching occurred in six of the nest yielding five fledged chicks. The probability of undiscovered fledglings still remains high.

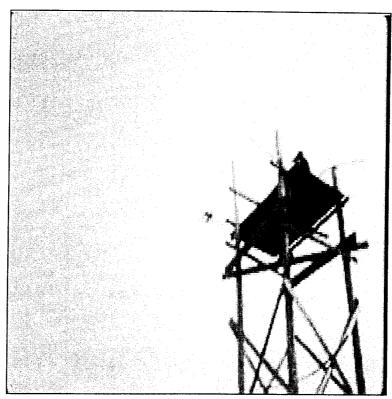
Table 8. F Little Bead	Estimated Pi ch Island, 19	ping Plove 194-99.	r Nesting Suc	cess at Edw	in B. Forsytl	ie NWR -
Year	Nesting Pairs	Total Nests	Successful Nests	Nests Lost	Chicks Fledged	Average Fledged/ Nesting Pair
1994	10	11	2	3	3	0.30
1995	15	11	6	3	5	0.33
1996	13	21	3	17	8	0.62
1997	8	12	0	9	0	0.00
1998	8	9	5	4	13	1.63
1999	7	8	5	2	14	2.00

On June 4, 1996 the five year International Piping Plover Survey was conducted at Holgate. Twenty-six adults were observed. No chicks were present. On June 6, 1996 the 5-year International Piping Plover Survey was conducted at Little Beach. Twenty-six adults also were observed along with one chick.

Peregrine Falcons -

Monitoring of the peregrine falcon continued at both Brigantine and Barnegat Divisions with observations being conducted by refuge volunteers. The Brigantine nesting tower is located on the cross dike separating the East and West Pools. In 1994, three chicks successfully fledged and were banded by Kathy Clark of the NJ Division of Fish, Game and Wildlife, Non-Game Species. The location for the Barnegat Tower is located on the AT&T Tract, located at the end of Beach Ave., Manahawkin. Because of the security issues at A T&T, volunteers going in to conduct observations must pass through a check point in order to get to the site. As usual, the female peregrine was very aggressive towards Kathy Clark and her banding helpers in trying to access the nesting box. After several near misses and a few wing brushes, two chicks were successfully banded.

Kathy Clark, NJDEP Division of Fish, Game and Wildlife - Nongame and Endangered Species Program, presented information and observation protocol to refuge volunteers prior to the start of each nesting season.



During the weeks of June 11 and 21,1995. Kathy Clark successfully banded chicks from each division.

Table 9. Pere NWR towers,	_	con product	ion (total yo	ung fledged	l) at Edwin	B. Forsythe
Year	1994	1995	1996	1997	1998	1999
Brigantine	3	2	4	0	4	0
Barnegat	2	2	1	2	2	1
Total Young	5	4	5	2	6	1

Bald Eagles -

Bald eagles were periodically spotted at refuge sites along the Mullica River and in the area of the Brigantine Division impoundments. Many observations of bald eagles were reported at the Brigantine Division, with many of those occurring during the winter months.

3. Waterfowl

The most common waterfowl species wintering on the refuge include black ducks, snow and Canada geese, Atlantic brant, green-winged teal, scaup, mallards, and bufflehead.

Because of reduced staffing and lack of funds, no refuge aerial waterfowl surveys were conducted during the period 1994 through 1999. New Jersey Department of Environmental Protection conducted aerial surveys throughout the state and it was able to collect refuge waterfowl data during these surveys.

Table 10 shows the 1994-99 summary of peak waterfowl tallies from the weekly wildlife drive surveys.

Edwin B. Forsythe National Wildlife Refuge

Table 10. Summary of Peak Waterfowl Use in the Refuge impoundments, adjacent saltmarsh and Lily Lake

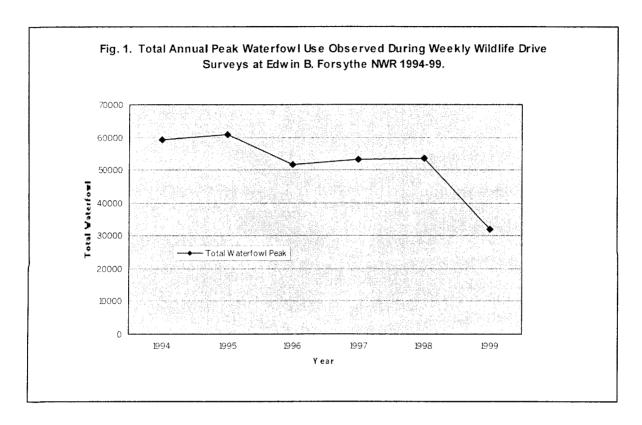
Data compiled from weekly surveys conducted by Refuge staff and the Atlantic Audubon Society

note: 1994 summaries incomplete; surveys not done in months 6, 7, 8 & 9 1999 summaries lacking surveys in June and most of May

* denotes peak use observed on more than one survey date

Species	1994	Date	1995	Date	1996	Date	1997	Date	1998	Date	1999	Date	Ave. Peak
Tundra Swan	400	12/1	233	1/13	181	12/5	233	11/13	750	11/12	238	12/2	339
Mute Swan	7	3/30	51	5/25	6	*	2	*	6	8/6	9	11/4	14
Snow Goose	21759	11/18	30169	10/19	12057	11/14	16476	10/23	14520	12/24	12003	12/23	17831
Canada Goose	509	5/27	1710	8/10	1785	7/11	1825	7/10	1762	8/27	1340	7/8	1489
Brant	19004	3/1	2850	11/9	15356	11/14	8226	10/30	17265	12/2	5556	1/21	4775
Mallard	752	11/10	872	10/26	279	10/24	2278	10/23	810	8/20	576	11/18	928
Am. Black Duck	2434	12/22	3364	11/9	10661	11/21	6056	1/2	1893	12/2	1829	12/30	4373
Gadwall	147	4/8	196	12/7	568	3/28	321	3/6	155	3/26	193	3/4	263
Northern Pintail	5696	12/1	11613	10/12	3005	10/10	3000	9/25	8730	10/1	5000	9/24	6174
Green-winged Teal	5700	11/3	6493	10/19	3772	11/14	10058	11/6	6402	10/8	3804	10/13	6038
Eur. Green-winged Teal	0		0		0		1	3/13	0		1	3/25	0.33
Blue-winged Teal	50	4/8	780	4/20	388	10/3	3248	10/2	4	*	18	9/15	748
Gargany Teal	0		0		0		1	6/12	0		0		0.16
American Wigeon	492	12/22	1023	12/7	942	10/24	150	10/9	102	12/2	400	10/29	518
Eur. Wigeon	0		1	*	6	2/28	0		0		1	10/13	1
Northern Shoveler	523	12/29	866	4/6	957	9/26	288	3/6	320	2/26	310	1/21	544
Wood Duck	6	11/10	23	9/7	30	9/26	42	10/2	45	9/17	18	11/4	27
Lesser Scaup	600	3/1	2	10/26	3	3/21	50	3/13	3	11/19	1	10/13	110
Greater Scaup	0		13	3/9	250	12/26	100	12/11	50	2/11	5	9/24	70
Bufflehead	207	11/18	192	1/26	270	11/7	111	2/6	108	12/2	109	3/18	166
Ruddy Duck	2	*	40	10/26	246	11/21	74	11/28	15	3/20	68	10/29	74
Ring-necked Duck	31	12/8	30	11/30	4	12/12	11	10/23	84	3/26	9	11/4	28
Canvasback	150	3/15	0		410	2/28	46	2/20	195	2/11	1	*	134
Redhead	0		0		3	2/8	0		0		1	1/21	0.66
Common Merganser	25	12/22	34	4/6	31	12/12	30	11/28	34	12/24	17	2/24	29
Hooded Merganser	631	12/29	293	12/7	319	11/21	402	11/28	152	12/2	339	11/18	356
Red-breasted Merganser	41	*	96	3/23	32	12/26	176	4/3	85	2/19	112	3/25	90
Ruddy Shelduck	0		0		4	9/26	0		0		0		0.66
Barrow's Goldeneye	0		0		0		0		0		0		0
Oldsquaw	0		0		1	11/21	0		0		0		0.16
Scoter	0		0		2	12/12	0		0		0		0.33
Common Goldeneye	0		0		2	11/7	5	3/13	1	2/19	0		1
Total Peak	59166		60944		51570		53210		53491		31958		

Total waterfowl tallied during the weekly wildlife drive surveys declined by 46% from 1994 to 1999 (Fig. 1.).



In 1998, an Americorp volunteer began revamping the wood duck box program at both divisions of the refuge. The volunteer was responsible for maintaining the boxes as well as installing new ones at various locations. Table 11. Shows wood duck nest box production in 1998-99.

Table 11. Woo Division, 1998-		production at Edwin B	3. Forsythe NWR - Brigantine
YEAR	# NEST BOXES OCCUPIED	ESTIMATED # NEST BOXES FLEDGED YOUNG	ESTIMATED # TOTAL FLEDGLINGS
1998	5	1	3
1999	8	1	1

4. Marsh and Water Birds

A variety of marsh and water birds may be found on the refuge including, but not limited to: great blue herons, great egrets, cattle egrets, snowy egrets, black-crowned night herons, glossy ibis, and clapper rails.

During the early 1990's, a small rookery existed in the bayberry in the middle portion of Holgate. During 1995, the site was predominantly used as a loafing area by these species. Small islands in the bay west of Holgate also provided nesting areas for these species. The New Jersey DEP surveyed these islands for rookeries.

State-listed threatened species such as the American bittern and black rail were present at both divisions. Though each was rarely observed, their calls were periodically heard from spring through fall. Cattle egrets feeding in the refuge fields and little blue herons feeding in the impoundments, were also a common sight at the Brigantine Division.

Brown pelicans continued to be regularly observed at the Holgate Unit. Approximately 35-40 pelicans were observed during late July and August. With the increase of size to nearby Tucker's Island and its growing public usage activities, fewer pelicans use this area now than back in the late 1980's. From 90 to 100 were a common sight in the late 1980's. No signs of pelican nesting activities were observed on Holgate or any of the bay islands.

Large numbers of herons, glossy ibis, and egrets used the Brigantine impoundments and surrounding salt marsh throughout the summer months. Peak populations were generally recorded in late July and early August.

Table 12 shows the 1994-99 summary of peak wading bird tallies from the weekly wildlife drive surveys.

Edwin B. Forsythe National Wildlife Refuge

Table 12. Summary of Peak Wading Bird Use in the Refuge impoundments, adjacent saltmarsh and Lily Lake

Data compiled from weekly surveys conducted by Refuge staff and the Atlantic Audubon Society

note: incomplete surveys for 1994 surveys incomplete for May and June 1999

* denotes peak use observed on more than one survey date

Species	1994	Date	1995	Date	1996	Date	1997	Date	1998	Date	1999	Date	Ave. Peak
Great Blue Heron	10	*	26	8/3	23	4/11	19	9/4	24	3/12	27	12/23	22
Little Blue Heron	0		13	9/7	4	*	3	9/12	3	9/10	10	8/5	6
Yellow-crowned	0	1	2	8/17	1	*	0		0		2	10/1	1
Night-heron													
Black-crowned	5	4/28	64	1/3	45	8/15	67	9/12	43	7/30	35	9/24	43
Night-heron													
Green-backed Heron	0		1	9/7	1	*	1	6/19	2	*	1	8/12	1
Tricolored Heron	2	4/28	1	*	2	*	6	9/12	2	7/30	1	8/5	2
Great Egret	24	4/28	239	9/7	136	9/26	57	9/18	35	7/30	105	8/12	99
Snowy Egret	73	4/15	332	7/13	184	8/29	70	9/4	56	9/10	75	8/26	132
Cattle Egret	1	10/20	20	9/28	7	5/2	7	6/12	5	*	3	9/3	7
Black-necked Stilt	0		4	6/15	0		0		0		0		1
American Avocet	1	5/27	3	10/19	8	10/30	2	*	0		0		2
White-faced Ibis	0		1	7/13	0		0		0		0		0.2
Glossy Ibis	490	4/15	545	7/13	231	7/11	1873	5/8	277	7/30	440	8/5	643
Total Peak	606		1251		642		2105		447		699		

Total wading birds tallied during the weekly wildlife drive surveys declined by 67% from a high in 1997 to 1999 (Fig. 2.).

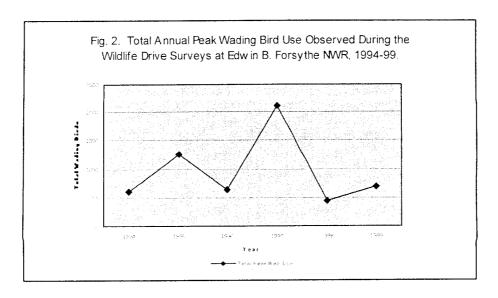


Table 13 shows the 1994-99 summary of peak water bird tallies from the weekly wildlife drive surveys.

Edwin B. Forsyth						<u>L. </u>	L	<u> </u>	1	<u> </u>	L	<u></u>	
Table 13. Summan												ly Lake	
Data compiled from	n week	ly surve	ys con	ducted	by Ref	uge sta	ff and t	he Atlar	ntic Aud	dubon S	Society		
	n	ote: in	comple	te sur	eys fo	r 1994,	no su	rveys d	one in	Augus	t 1997		
		sur	veys ir	compl	ete for	May a	nd Jun	e 1999		1			1
* denotes peak use	obser	ved on	more tl	nan one	surve	/ date							
Species	1994	Date	1995	Date	1996	Date	1997	Date	1998	Date	1999	Date	Ave. Peak
Red-throated Loon	0		0		0		0		0		0		0
Common Loon	0		0		0		0		0		0		0
Horned Grebe	30	12/1	16	1/13	17	12/12	17	11/13	10	*	15	11/11	18
Pied Billed Grebe	21	11/18	2	*	6	10/3	7	10/16	23	11/19	6	9/24	11
Double-crested	68	4/28	270	4/27	156	10/3	76	10/16	72	5/7	93	9/24	123
Cormorant			Ì										
Clapper Rail	5	4/28	7	7/27	4	8/8	2	*	2	7/16	4	8/18	4
Virginia Rail	0		1	4/20	2	9/19	1	6/12	0		0		1
Kingfisher	2	1/13	2	*	1	*	3	10/2	0		5	10/13	2
Gull-billed Tern	0		26	6/1	17	5/10	51	5/15	18	5/21	15	8/5	21
Royal Tern	0		0		0		1	9/12	1	6/11	0		0.33
Caspian Tern	0		1	8/24	2	8/15	0		1	9/3	1	8/5	1
Common Tern	11	4/28	223	8/10	103	7/11	53	6/4	60	8/20	45	8/18	83
Forster's Tern	67	10/20	228	9/21	154	8/29	59	9/12	57	5/7	53	8/5	103
Least Tern	Ö		14	7/13	35	5/30	4	7/10	4	9/3	1	5/13	10
Black Skimmer	0		290	7/13	31	7/4	42	6/4	46	7/30	9	7/8	70
American Bittern	1	*	0		1	8/29	1	10/2	0		2	10/13	1
Oystercatcher	0		7	5/11	193	8/29	3	7/17	6	6/18	23	5/13	39
American Coot	8	12/8	68	12/7	17	11/7	27	11/6	14	12/2	12	11/4	24
Common Moorhen	0		0		0		0		0		1	5/13	0.2
Total Peak	213		1155		739		347		314		285		

Total waterbirds tallied during the weekly wildlife drive surveys declined by 75% from a high in 1995 to 1999 (Fig. 3.).

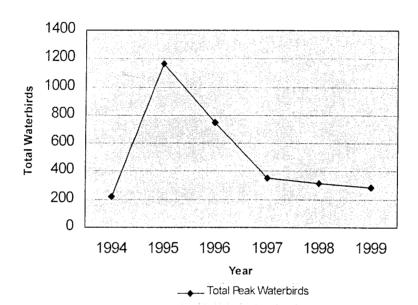


Fig. 3. Total Annual Peak Waterbird Use observed during Wildlife Drive Surveys at Edwin B. Forsythe NWR 1994-99.

5. Shorebirds, Gulls, Terns and Allied Species

The mud flats and shallow water areas of the saltmarsh and Brigantine impoundments provided excellent foraging for shorebirds. Species that used the areas included semipalmated sandpipers, short-billed dowitchers, dunlins, willets, and black-bellied and semipalmated plovers. Autumn drawdowns of the west pools provided excellent feeding areas for the migrating masses. The mudflats and intertidal zone at Holgate's south end also provided a feeding bonanza for both spring and fall migrants. The species mentioned above as well as whimbrels, willets, greater and lesser yellowlegs, oystercatchers, and ruddy turnstones used the south end of Holgate.

Biologist Turner and staff from Manomet Bird Observatory conducted surveys during the 1995 migration periods to estimate the health of the population of shorebirds along the Atlantic flyway. Staff from Manomet also conducted a feeding disturbance study at both Holgate and Brigantine during the fall migration. The focus of the study was to determine the impact of different uses (walking, jogging, cycling, motor vehicle driving and birdwatching).

Table 14 shows the 1994-99 summary of peak shorebird tallies from the weekly wildlife drive surveys.

Edwin B. Forsythe National Wildlife Refuge

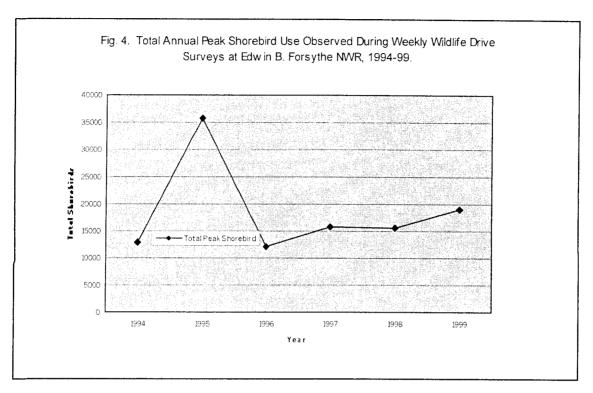
Table 14. Summary of Peak Shorebird Use in the Refuge impoundments, adjacent saltmarsh and Lily Lake

Data compiled from weekly surveys conducted by Refuge staff and the Atlantic Audubon Society note: incomplete surveys for 1994, no surveys done in August 1997; surveys incomplete for May and June, 1999

* denotes peak use observed on more than one survey date

Species	1994	Date	1995	Date	1996	Date	1997	Date	1998	Date	1999	Date	Ave. Peak
Black-bellied Plover	100	11/18	180	9/7	669	8/29	335	10/16	301	8/6	612	5/13	366
Semipalmated	100	11/18	2455	8/10	555	8/29	1366	7/31	3456	8/6	1067	5/13	1500
Plover					<u> </u>								
Ruddy Turnstone	93	5/27	94	5/25	20	5/30	192	5/29	145	5/21	19	5/13	94
Greater Yellowlegs	353	11/18	1339	10/19	674	9/5	211	9/12	1388	10/22	2076	10/13	1007
Lesser Yellowlegs	22	11/3	26	9/7	143	8/29	75	10/23	66	7/30	453	8/5	131
Short-billed	2227	10/20	2061	7/27	377	7/25	879	7/31	562	8/6	733	8/12	1140
Dowitcher										l	ľ		
Long-billed	0		19	10/19	28	10/30	0		6	10/22	45	10/6	16
Dowitcher		Ì]						
Dunlin	2527	11/10	2049	10/12	5441	11/7	8944	10/30	4000	10/8	8519	11/11	5247
Killdeer	20	11/23	29	3/9	3	7/18	34	4/3	4	3/20	3	*	16
Least Sandpiper	556	10/20	872	8/10	475	8/29	100	5/8	515	7/30	842	7/22	560
White-rumped	0		60	11/9	21	10/30	0		6	10/8	38	8/18	21
Sandpiper				İ		1							
Spotted Sandpiper	26	5/27	13	8/10	14	7/18	8	5/15	15	5/21	50	7/15	21
Solitary Sandpiper	0		4	5/11	0		0		0		0		1
Western Sandpiper	10	4/15	101	8/17	403	10/30	0		131	10/22	267	11/11	152
	0		2	4/20	1	8/29	0		0		1	9/3	1
Pectoral Sandpiper													
Stilt Sandpiper	1	5/27	49	8/17	12	8/29	5	5/22	12	9/10	75	10/22	26
Semi-pal. Sandpiper	6864	10/20	24956	8/10	3142	8/15	3390	10/23	4870	8/20	4045	8/12	7878
Red Knot	0		0		0		0		0		1	9/3	0.2
Piping Plover	0		0		0		0		0		1	8/12	0.2
Sanderling	0		1366	8/10	0		72	6/4	0		6	5/13	241
Common Snipe	0		1	10/26	0		0		1	5/7	0		0.33
Red-necked	0		0		1	8/29	2	9/18	0		0		0.5
Phalarope													
Wilson's Phalarope	0		0		1	8/29	1	*	4	8/20	3	8/18	2
Marbled Godwit	0		0		0	44/5	4	10/16	1	6/11	2	8/12	1
Hudsonian Godwit	0		0		3	11/7	0	5/4	0		2	10/6	1
Ruff	0	4/00	0	File	0	F /0.0	1	5/1	0	F /	0	4/00	0.2
Willet	36	4/28	83	5/11	66	5/30	68	6/19	82	5/7	98	4/29	72
Whimbrel	34	4/28	60	4/27	69	4/25	42	5/15	24	5/14	47	4/29	46
Total Peak	12899		35675		11978		15611		15477		18853		18418.4

Total shorebirds tallied during the weekly wildlife drive surveys declined by 47% from a high in 1995 to 1999 (Fig. 4.).



Nesting Least Terns & Black Skimmers -

In 1994, only one least tern colony of 16 adults was observed at Holgate, and only one least tern colony of 25 adults was observed at Little Beach Island. Both colonies were abandoned. No nesting occurred at either location from 1995 through 1999. Gull predation may have caused the least terns to stop using Holgate and Little Beach. During the late 1980's, Holgate hosted the second largest least tern nesting population in New Jersey with over 2,200 nesting pairs.

Table 15 shows nesting trends for least terns and black skimmers at Edwin B. Forsythe NWR during 1994-2001.

Table 1: 99.	5. Lea	st tern	and bl	ack sk	immeı	r nestin	g at Eo	dwin I	3. Forsy	the NV	VR, 19	94-
			Least	Tern]	Black S	kimme	rs	
		Holgat	e	Little Beach				Holga	te	Little Beach		
Year	Adults	Nests	Fledged	Adults	Nests	Fledged	Adults	Nests	Fledged	Adults	Nests	Fledged
1994	16	6	-	25	6	-	0	0	0	0	0	0
1995-99	0	0	0	0	0	0	0	0	0	0	0	0

In 1994, the first black skimmer was observed on Holgate on May 10. Over the next several days more skimmers continued to arrive until about 60 were loafing on Holgate's south end. By the middle of July, all the skimmers had left Holgate. No colonies or nests were established during this period. Historically, Holgate supported as many as 425 nesting pairs during the breeding season. The specific reason for this trend and activity is still unknown.

The majority of the least terns and black skimmers that nested on Long Beach Island relocated to Barnegat Light State Park which is the north portion of the island.

6. Raptors

Raptor species that are frequently observed on the refuge include red-tailed hawks, sharp-shinned hawks, red-shouldered hawks, northern harriers, great-horned owls, and short-eared owls. Kestrels and merlins may be seen on occasion, and even snowy owls make an appearance from time to time. Table 16 shows the 1994-99 summary of peak raptor tallies from the weekly wildlife drive surveys.

Since Holgate began its seasonal closure in 1987, osprey use of the osprey nesting platform during the nesting seasons has continued without interruption, all with successful results. A volunteer from the state banded the chicks before they fledged.

Edwin B. Forsythe National Wildlife Refuge

Table 16. Summary of Peak Raptor Use in the Refuge impoundments, adjacent saltmarsh and Lily Lake

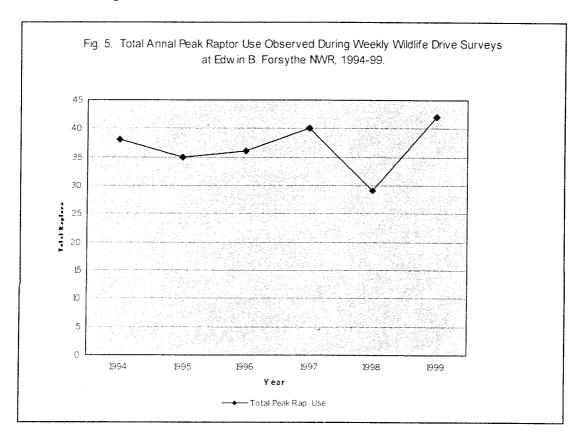
Data compiled from weekly surveys conducted by Refuge staff and the Atlantic Audubon Society

note: incomplete surveys for 1994 surveys incomplete for May and June 1999

* denotes peak use observed on more than one survey date

Species	1994	Date	1995	Date	1996	Date	1997	Date	1998	Date	1999	Date	Ave. peak
Peregrine Falcon	2	*	4	10/19	6	8/29	2	*	6	6/11	5	10/13	4
Northern Harrier	14	12/29	14	1/26	8	3/7	22	12/11	9	*	14	11/11	14
Osprey	3	4/8	6	6/1	6	4/4	3	*	4	5/14	6	5/13	5
Merlin	0		1	9/7	1	8/29	2	9/4	1	*	2	9/15	1
American Kestrel	2	4/8	1	*	1	*	2	9/4	2	9/3	2	9/15	2
Red-tailed Hawk	7	12/29	3	*	4	3/21	3	*	4	11/19	3	12/23	4
Sharp-shined Hawk	1	*	1	*	1	*	1	*	1	*	2	9/24	1
Cooper's Hawk	1	11/18	0		1	*	1	11/6	0		1	*	1
Northern Goshawk	0		0		0		0		0		1	10/13	0.2
Red-Shouldered Hawk	1	10/20	0		0		0		0		0		0.2
Rough-Legged Hawk	1	*	0		1	*	0		0		0		0.33
Bald Eagle	2	11/3	1	*	3	*	3	10/16	2	12/2	4	11/11	3
Golden Eagle	1	*	0		0		0		0		0		0.2
Barn Owl	1	*	2	*	0		0		0		1	8/18	1
Snowy Owl	0		0		1	12/26	1	*	0		0		0.33
Great Horned Owl	1	3/15	1	12/7	0		0		0		1	10/13	1
Short-eared Owl	1	3/1	1	*	3	2/22	0		0		0		1
Total Peak	38		35		36		40		29		42		

Total raptors tallied during the weekly wildlife drive surveys increased by 45% in 1999 from a low in 1998 (Fig. 5.).



8. Game Mammals

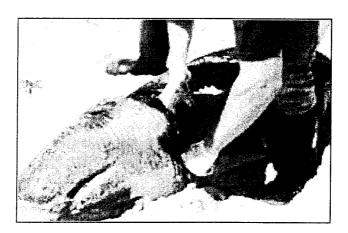
For 12 years now, white-tailed deer hunting has been permitted on the refuge. (See Section H. Public Use, Sub-section 8. Hunting). The objective of the hunt is to maintain the refuge deer herd within the carrying capacity of the habitat. Rapid development continues adjacent to the refuge, forcing deer to become more dependent on refuge habitat. More importantly, the development reduces hunting opportunities and thus reduces the means of deer population regulation.

9. Marine Mammals

Wash-Ups in Holgate 1995

On May 10, 1994 Biologist Turner and the plover seasonals discovered a dead dwarf sperm whale at the 9,800 foot mark of Holgate. As with all marine strandings, the Marine Mammal

Stranding Center, located on Brigantine Island, NJ, was contacted to assist in the investigation. A team of technicians from the Stranding Center came out and performed a necropsy on the whale. After examining the internal organs, nothing was found that could have contributed to the whale's death. After that examination, the technicians then proceeded to remove the head of the whale to determine if a brain parasite could have made the whale disorientated and beach itself. Dwarf sperm whales are rarely found off the New Jersey shore.



On May 11, 1994 Long Beach Township personnel used a front-end loader to bury the whale deep enough so tides would not make the whale resurface again. It was critical that the whale be buried to avoid attracting predators.

11. Fisheries Resources

Lily Lake Dam Reconstruction - Fish Relocation Project

In 1999, Lily Lake (22 acres) was drained for a dam reconstruction project (See Section I. Equipment and Facilities, Sub-section 2. Rehabilitation). The project included relocating fish downstream to Doughty Creek (60 acres). Gary Swihart, of the Service's Fisheries Assistance Office, conducted the relocation on June 2-3. Gary provided all necessary equipment including the electroshock boat, nets, and a holding tank. The fish were weighed and measured before they were relocated.

Gary had also electroshocked fish at Lily Lake in May.1988 for a general survey, and the results were similar. In 1999, reproduction appeared low for large-mouth bass, pumpkinseed, and bluegill given the low fish recovery and measurements (Table 17). Vegetation consisted

primarily of the *Nymphaeae spp*. (water lily). American eel was the most abundant species captured, but no measurements were taken. The New Jersey Division of Fish and Game - Nacote Creek Research Station requested and received 12 eel specimens for additional research. Gary speculated that the low capture was due in part to the excessive vegetative cover.

	-	T			e Office, J				
Large-mou		 	ed Sunfish	Bluegill St		Chain Pick		Brown Bul	
(Microoters)	us	(Leoomis g	ibbosus)	(Lepomis A	Macrochirus)	(Esox Nige	r)	(lctafurus i	nebulosus)
Lengtha	Weight ^b	Length	Weight	Length	Weight	Length	Weight	Length	Weigh
195	100	142	75	328	175	290	110	367	850
276	250	105	23	146	65	316	155	374	800
281	300	130	42	193	175	265	90	395	900
285	300	195	160	210	210	222	50	418	1325
285	300	171	125	242	310				
322	425	181	150	221	250				
303	375	200	200	241	340				
304	360	150	75	204	190				
302	375	165	105	243	320				
312	390	179	150	235	300				
310	360	218	225	217	210				
324	450	204	200	230	300				
315	390	210	230	200	210				
301	350			223	255				
321	500			226	260				
327	475			239	290				
312	425			230	270				
350	560			235	300				

334	550		235	300	
415	925		234	325	
490	1625		225	300	
395	950				
391	780				
431	1225				
^a millin	neter, ^b grar	ns			

Gary recommended controlling the water lilies in Lily Lake. Water lilies provide little benefit to fish species present. Gary also recommended liming the lake. Calcium hardness in the lake was at 12-15 ppm. Increasing this to about 50 ppm would be beneficial for plant growth and would not affect native species.

On June 2, Dan Russell and Clay Sterns, NJFO - Ecological Services, collected fish (Table 18). All habitat types were sampled. Veronica Varela, NJFO - Ecological Services, arranged for the fish to be analyzed for mercury. Lily Lake served as a reference control site in mercury analysis.

Table 18. Fish collected at Lily Lake, Edwin B. Forsythe NWR by NJFO - Ecological Services Office for contaminant analyses, June 2, 1999.				
Species # Collected				
American Eel (<i>Anguilla rostra</i>)	5			
Chain Pickerel (Esox Niger)	3			
Bluegill (<i>Lepomis Macrochirus</i>)	5			
Bluegill fry (Lepomis Macrochirus)	15			
Pumpkinseed Sunfish (Leoomis gibbosus)	6			

15. Animal Control

Holgate Trapping -

During the piping plover nesting season at Holgate. USDA Animal Damage Control personnel removed predatory mammals from Holgate. Several foxes and opossums were removed by using snares and have-a-heart live traps. All animals that were captured were humanely dispatched and removed from Holgate (See Section H Public Use, Sub-section 10. Trapping).

The Department of Agriculture removed mammalian predators from Holgate and Little Beach to reduce the threat of predation on the piping plover. In 1997, no predators were physically removed, but 12 fox dens were gassed using carbon monoxide gas cartridges. Though fox numbers were reduced, fox sign could still be seen at both locations.

We compiled data on the total resident Giant Canada Goose nests destroyed during the breeding seasons of 1997-1999. Nests were destroyed via a combination of egg-addling and impoundment flooding techniques (Table 19).

Table 19. Resident Giant Canada Goose nest destruction efforts by refuge officials at the Edwin B. Forsythe NWR - Brigantine Division, 1997-99.							
YEAR #OF NESTS #OF EGGS LOCATION ME							
1997	15	60	West Pool	Egg-addling			
1998	56	130	East/West Pools	Egg-addling			
1999	33	-	East Pool	Flooding			

16. Marking and Banding

Canada Goose Observations -

In January. 1994 Biologist Turner continued to monitor neck-collared Canada geese throughout Atlantic and Ocean Counties. The observations were part of a Northeast study of neck-collared Canada geese to determine resident and migratory populations. Along with regular observations. Turner also searched for new areas to conduct winter banding of

Canada geese. Banding was conducted with the NJ Division of Fish, Game, and Wildlife. Each goose was leg-banded and neck-collared for identification at a distance. Each neck collar has a unique series of characters.

From September through December, 1996 Biologist Turner collected data on neck-collared Canada geese as part of the research study. Turner collected data on and off-refuge lands in Ocean and Atlantic Counties.

17. <u>Disease Prevention and Control</u>

During the week of May 13, 1996 the oil tanker Anetra spilled oil in the Delaware Bay. By the weekend, the oil found its way to the town of Avalon. On the 21st, a task force of refuge personnel. ES, and New Jersey Fish, Game and Wildlife walked the beaches of Ocean City to search for oil balls and oiled birds. All oils found were collected and properly disposed of. By the 28th, the oil had made its way to Holgate and Little Beach Island. Because of the amount of oil found at both locations, the State provide a labor force from the State Department of Correction to assist with the clean up of both beaches. This clean-up effort continued through the week. Clean-up operations at Holgate were completed on June 2. The refuge beaches, along with nearby State beaches were thoroughly cleaned. Twelve plovers were observed with some type oil staining; four were captured for cleaning.

H. PUBLIC USE

1. General

During 1995 the refuge received almost 170,000 visits. Eighty-four percent of this visitation occurred at the Brigantine Division, where all of the refuge's public use facilities were located. Approximately 27,000 visits were made to the refuge's Holgate Unit, during the piping plover's non-nesting season (September 1 to March 31). Holgate is an important nesting area for the threatened piping plover. While folks are welcome to visit this segment of the refuge during the non-nesting season, it is closed to all public access each year during the plovers' nesting season -- (April 1 to about September 1).

Due to reduced FTE allocations, in January 1995 the station's seasonal weekend entrance fee collector's position was permanently canceled. For the balance of this reporting period, the refuge was on the honor system.

During January, 1995 unseasonably warm weather brought an estimated 10.670 visits to the refuge. The Holgate Unit -- normally a bitterly cold and windswept site in January --

received an estimated 2.500 visits. Warm temperatures continued into February, reaching up into the 50's and 60's. During February, the refuge received an astounding 15,565 visits. This was 88 percent higher than for the same period in 1994, when icy conditions prevailed.

On Sunday April 2, 1995 Refuge Outdoor Recreation Planner Rubenstein and E.S. Field Office Biological Technician Scott Lemieux staffed a table at the Kids Fair -- a major public event held at the Atlantic City Convention Center. An estimated 20,000+ kids and their parents attended. Rubenstein and Lemieux planned and staffed a "touch table," replete with wildlife artifacts and interpretive signs to entice kids and their parents to think about the importance of habitat to wildlife. Questions on every imaginable wildlife topic were fielded. Seasonal closure of the Holgate Unit began on April 3, 1995 as piping plover activity in the area continued to increase. While Holgate was closed to all public access throughout the Jersey Shore's busy summer tourist season, thousands of informational contacts were made at Holgate's northern boundary. Beach goers wandering down to Holgate from tourist communities elsewhere on Long Beach Island contacted refuge volunteers and staff or read refuge interpretive signing about the birds, the beach, and the closure.

On August 24, 1995 Holgate was re-opened to public access. About 500+ visits were made there during that week alone, as eager visitors came out to walk, fish, beachcomb, and otherwise enjoy a pristine beach experience.

On April 5, 1995 the refuge hosted a meeting of the Ecosystem Management Team committee for public outreach. Participants included representatives of the E.S. field offices for New England, New York and New Jersey, and Forsythe Refuge. The meeting was fruitful, as the group outlined strategies to provide ESA information to Congressionals.

During May 1995, Outdoor Recreation Planner Rubenstein distributed the Service's new 11-1/2 minute Endangered Species Act video to a wide variety of both local organizations and major institutions, for example, the Bronx Zoo, Philadelphia Zoo, New England Aquarium, National Aquarium at Baltimore, and New Jersey Aquarium at Camden. Kiwanis Clubs, Rotary Clubs, Atlantic Audubon, Ducks Unlimited and a local cable TV channel.

In 1995, on Mothers' Day a local media representative interviewed ORP Rubenstein, and visited the Drive to gather information and photographs.

During the Duck Stamp Year ending June 30, 1995, the refuge sold 445 duck stamps (232 for entrance passes, 179 for waterfowl hunting, and 34 for collecting.

In fiscal year 1995 the refuge's total entrance fee receipts for all pass types totaled \$39,977. Associated fiscal year costs for administration of the fee program were estimated to be \$6,823.

The refuge was closed due to Government shutdown from November 13 - 19, 1995 and again from December 18, 1995 to January 6 1996. As a result, visitation for all purposes was denied at both refuge Divisions. Overall refuge visits totaled only 3,900 in December, compared to 9,500 for December 1994. The above data indicated that the December shutdown reduced visitation by 5,600 (60 percent) in December. Many of the folks who had to be turned away were irate. A skeleton crew of one "critical" staffer per Division remained on duty throughout the shutdowns. They ensured that the refuge remained closed to all entry, and took all the heat from the disgruntled public.

2. Outdoor Classrooms - Students

Teachers brought an average of 2,844 students to the Brigantine Division per year from 1994 through 1999 (Table 20). Most registered their groups with refuge staff in advance. Many received an orientation by staff or volunteers and viewed videos in the refuge auditorium. They also had the option of having a guided tour conducted by volunteers from the Atlantic Audubon Society or available staff if arranged prior to their arrival. Due to the Federal government shutdown November 13 -19, 1995 and December 18, 1995- January 6, 1996, no groups were admitted during that time. In 1998, a highlight was the Smithville School Wetlands Festival held on May 22.

Table 20. School group visitation (teachers and students) to the Brigantine Division, Edwin B. Forsythe NWR, 1994 - 1999.								
Year	1994	1995	1996	1997	1998	1999		
Teachers	0	0	1	0	0	0		
Students	1450	1751	2648	1216	5000	5000		

The Barnegat Division also received a small number of visiting school groups each year. From 1994 - 1998 there wasn't a specific public use area for groups in the division, although some teachers near the Barnegat Division requested and received special use permits to bring their classes to areas at Barnegat normally closed to public access.

In 1998, the Barnegat Platform/Walkway was constructed by The AmeriCorps Program and Boy Scouts as part of an Eagle Scout project. This provided a universally accessible trail for everyone in the area, including school groups. Although groups do not have to register to use the trail, many have contacted the Barnegat Division staff after visiting the area. The platform looks out on an impoundment which offers an opportunity to study wetlands habitat and wildlife.

3. Outdoor Classrooms - Teachers

(See Section H. Public Use, Sub-section 2. Outdoor Classrooms - Students)

4. Interpretive Foot Trails

Typically, approximately 24 percent of Drive visitors also visit the Leeds and Akers nature trails (Table 21). The vast majority of foot trail visits occur in spring and fall, when migratory birds are visible and weather conditions are optimum. During the summer months, unrelenting heat and biting flies keep foot trail visitation very low.

Table 21. Estimated visitor use at designated self-guided trails and Wildlife Drive auto tour at Edwin B. Forsythe NWR, 1997-99. No data was available for 1994-96 and 1998.							
Year	Self-guided auto	Self-guided foot	% of auto tour users using foot trails				
1997	92,957	22,610	24				
1999	125.000	30,000	24				

Benches were installed along the refuge's two short loop foot trails in April 1995, as part of a BSA Eagle Scout project. Installation of 12 benches along the Leeds and Akers Trails helped to bring the refuge closer to meeting its 504 commitments.

In June 1995, a new wildlife-oriented interpretive sign was installed at the head of the Leeds Eco-Trail. Most trail visitors did stop to read it, and the presence of the sign itself seemed to draw additional visitors to the site.

The Reedy Creek Trail (DeCamp Trail) was dedicated in spring 1997.

6. Interpretive Exhibits/Demonstrations

Table 22. Estimated visitor use of self-guided interpretive exhibits at Edwin B. Forsythe NWR, 1997-99. No data was available for 1994-96 and 1998.						
Year	Self-guided Headquarters Auditorium	Self-guided interpretive exhibits				
1997	2,616	62,138				
1999	360	20,000				

Ocean County Decoy and Gunning Show-Tuckerton, NJ

Each year from 1994 through 1999, the refuge participated in the annual Ocean County Decoy and Gunning Shows in Tuckerton, NJ. The refuge had a display table providing waterfowl hunting information, refuge information, and sold federal duck stamps each year.

8. Hunting

Deer -

Refuge deer hunting continues to be one of the most popular management/recreational activities on the refuge. The refuge has three zones which have quotas allowing a limited number of hunters to hunt.

In 1994, almost all of the permits for each of the refuge hunt zones were sold. Harvest data for the hunt zones are as follows: Zone 56, 13 deer; Zone 57 Muzzleloader, 2; Zone 57 Shotgun, 13: Zone 58 Permit Bow, 4; Zone 58 Muzzleloader, 3; Zone 58 Shotgun, 18. We believed that some hunters did not bring their deer to an official deer check station for recording, so the actual harvest was likely higher. Contact with hunters is somewhat difficult and our only measure of what's going on in the field is through hunter report cards issued by the Brigantine Division. A system will need to be devised to become more personal with our refuge hunters.

In 1995, due to Government furlough, deer hunters were also closed out of the Refuge for 11 days of the Refuge's 14-day muzzleloader season. After the shutdown ended, hunters with Refuge muzzleloader permits were allowed to hunt Refuge units for two weeks in January 1996.

On October 26, November 2, 16, and 23, 1997 hunter orientation classes were given at the Brigantine and Barnegat Divisions. Orientations are to familiarize new refuge deer hunters on the proper and legal way to hunt on the refuge. Because many of the refuge hunters are regulars, attendance to the orientation sessions continues to be light. This is the first year we required a Refuge rubber stamp on all licenses.

In 1999, 340 deer hunters participated in refuge deer hunts.

Waterfowl -

In 1995 the refuge was opened for New Jersey's early (resident) Canada goose hunt season, which occurred from September 6 - 15, 1995. Access to Brigantine Division hunt units was by boat only. Although Refuge staff were waiting at Scotts Landing (the Refuge's only boat ramp) to check the bags of incoming hunters, no hunters showed up! Since Canada geese do not regularly frequent Brigantine Division hunt units in September, and because it was so warm, it was no surprise that hunter interest in this early season was nil.

On the first day of the 1995-96 snow goose season, 18 hunters reported launching from Scotts Landing. Each hunted an average of 6.2 hours, and bagged an average of .81 geese for the day's efforts.

On the first day of the first 1995-96 brant/duck split, 17 hunters reported launching from Scotts Landing. Each hunted an average of 5 hours, bagging an average of 2.1 birds Only 20 percent of the birds harvested on this day were ducks.

The Government shutdown (November 13 - 19, 1995) prevented Refuge waterfowl hunting for the entire last week of the popular first duck/brant split. Area waterfowl hunters were greatly inconvenienced, and didn't hesitate to show their disappointment.

By the time the second split of the 1995-96 season occurred, only 19 waterfowl hunters reported launching from Scotts Landing over the entire month of December -- compared to 151 in December 1994.

In September. 1995 the Refuge sent out a news release highlighting the requirement to use nontoxic shot for coots and moorhens hunted on Refuge lands.

Waterfowl Hunt Unit 1 was expanded for the 1997 hunting season.

In 1997, 630 waterfowl hunters were tallied on refuge hunt units. In 1999, 1,600 waterfowl hunters were tallied on refuge hunt units.

Special Impoundment Goose

Special Impoundment Goose Hunts have been conducted annually at the Edwin B. Forsythe - Brigantine Division impoundments since 1997. Specifically, resident Giant Canada Goose (*Branta canadensis maxima*) and Greater Snow Goose (*Chen Caerulescens atlantica*) hunts commenced in January1997 and October 1998, respectively. Fall hunts were conducted once weekly during September and October (to early November) for resident Canada Geese and Snow Geese, respectively. Winter hunts were conducted once weekly during the months of January and February focusing on resident Canada Geese. During the winter hunts, Snow Geese were hunted opportunistically when present. The primary objectives of these hunts were to curb the exploding growth of these goose populations to reduce deleterious impacts to habitat and to provide adequate forage for other migratory birds including migrant Canada Geese of the North Atlantic Population. As such, these hunts have been implemented primarily as a management tool with a side-benefit of increased recreational opportunities.

Each week, the day before a scheduled hunt, hunters had to call in reservations starting at 8:00 a.m. on a first-come, first-served basis. There were 18 impoundment hunt sites and nine saltmarsh hunt sites. On the hunt days, hunters randomly chose a lottery number, which determined the order in which the hunters selected sites. At the end of the hunt, hunters had to check in for bag-checks, leg-band reports and hunting effort.

On a weekly basis, during the Special Impoundment Goose Hunts, a **minimum** of 2-3 staff-days were required to conducted the hunt (Table 23):

Table 23. Weekly staff-days required to conducted the Special Impoundment Goose Hunts at Edwin B. Forsythe NWR - Brigantine Division.					
1 Staff-day	Prospective hunters must call in reservations for the next morning's hunt each weekday before the hunt. All hunters are required to check out at the termination of each hunt for bag-checks, leg-band reports and hunting effort. Occasionally, waterfowl technicians from the New Jersey Division of Fish & Wildlife will sex and age harvested birds. Data from bag-check forms are entered in the Filemaker Pro database with all other hunter information.				
2 Staff-days	At approximately 4:15 am on the morning of the hunt, two staff members including one LE officer (a 2 nd shift LE officer will take over midday) and one additional person are present to sign hunters in and to administer the hunter orientation. The LE officer opens all gates to allow hunter access. Hunter orientation commences at the refuge auditorium at approximately 4:45 am.				

1 Staff-day^a

Throughout the hunted days, volunteers provide non-hunting refuge visitors with information related to the Wildlife Drive closure at the front gate. Volunteers also tally the number of non-hunting visitors turned away. Pamphlets on alternative wildlife viewing sites and hunting information sheets are handed out to interested visitors that are contacted there.

^a Non-paid volunteer staff-day effort.

Canada Goose Hunts -

Mean hunter participation for the Canada Goose hunts from winter-1997 through the 1998-99 season (\bar{x} = 218, n=3).

the \bar{x} harvest for all Canada Goose hunts from winter-1997 through the 1998-99 season (\bar{x} = 154, SE=50, n=3)

Canada Goose hunters harvested 0.70 birds/hunter during the winter-1997 through the 1998-99 season.

Snow Goose Hunts -

Mean Snow Goose hunter participation peaked at 276 hunters during the 1998-99 season. This peak hunter participation resulted in a peak harvest of 675 Snow Geese during the 1998-99 season.

9. Fishing

Barnegat Permit Perch Fishing -

The second year of perch fishing seasonal permits concluded on April 30, 1994. Permit requests decreased from 11 in 1993 to 4 during the 1994 season and fishing activities remained low. For these reasons, the refuge discontinued the perch fishing season permit program.

Holgate Surf Fishing & Clamming -

Anxious surf fishers waited for the official opening of Holgate around September 1 of each year, 1994-99 to access the beach front for their favorite late summer recreation. Most

ADDENDUM

Trapping in Wilderness Areas. See Page 67 (Section H. Public Use, sub-section 10. Trapping).

I	Table 25 (b). Total furbearer trapping harvest conducted by USDA - Animal Damage
	Control personnel at Holgate Unit (HU) and Little Beach Island (LBI), Edwin B.
	Forsythe NWR, 1996-99.

	1996		1997		1998		1999	
Species	HU	LBI	HU	LBI	HU	LBI	HU	LBI
Red Fox	3	-	-	-	12	1	5	2
Opossum	6	-	-	-	-	-	-	-
Dens Treated	16 colle	ectively	4	8	4	3	-	5
Feral Cat	-	-	-	-	-	-	1	-

Forsythe NR94-99 - "Brigantine Division Insect Fauna Study". See Page 16 (Section D. Administration, sub-section 5. Research and Investigations).

Both the north and south sides of the West Pool were seasonally productive of invertebrates (principally caddisflies, midges and corixids). The bulk of aquatic and semi-aquatic forms were found on mudflats and *Eleocharis* beds. These substrate types grade into each other. *Eleocharis* beds covered by shallow water appear relatively rich in invertebrates as do flooded cracks in dried mudflat. Anaerobic conditions, ice, and drying may be key factors that shape aquatic invertebrate assemblages.

In 1995, subsequent to sub-impoundment of the West Pool, the NW Pool showed greater numbers of Hemipterans and Hydracarina (76.3% and 75.4% of the total collected, respectively). The SW Pool showed greater numbers of Amphipods and Dipterans (90.0% and 68.9% of the total collected, respectively). Other groups represented in the study (Odonata, Copepoda, Coleoptera and Tricoptera) had similar abundances between the units. Assemblage differences between the units is thought to be due to substrate types and amount of living vegetation.

anglers use 4X4 trucks to drive down the beach. Southern Ocean County Chamber of Commerce sponsored a annual surf fishing tournament with daily and weekly cash prizes. The tournament ran for the entire month of October until the middle of November. Stripped bass, bluefish and flounders are the preferred game fish for local anglers.

Clamming at Holgate continued to be popular. During the non-nesting season, clammers were permitted to anchor boats on land, clam within the south end cove, and walk along the mudflats of Holgate's West Spit. During the Holgate closure, boats were required to remain in the water, the cove was closed, and all clamming activities had to be done in wading water or deeper. Even with the restrictions, clammers continue to harvest a plentiful bounty.

Table 24 shows total visitor use estimates for saltwater fishing and clamming activities on the refuge during 1997 and 1999.

Table 24. Estimated visitors participating in saltwater fishing and clamming at Edwin B. Forsythe NWR, 1997-99. No data for 1994-96 or 1998.						
Year	Saltwater FishingClamming					
1997	39,950					
1999	50,000					

Freshwater Fishing -

A total of 730 and 800 anglers were tallied using Lily Lake for freshwater fishing in 1997 and 1999, respectively.

10. Trapping

The refuge had an active trapping program for both the Brigantine and Barnegat Divisions. Trapping as a management practice has been allowed on the refuge since the 1986-87 season. Fourteen trapping units were open to trapping, seven in each division. No beaver or otter trapping was permitted within the refuge trapping units.

In 1994, because fur prices were at record lows, only four trappers submitted bids for nine trapping units. The price for each trapping unit ranged from as low as \$10 to \$40, depending

on furbearer productivity within the unit. In 1994, Brigantine saw the lowest harvest since the program began, while Barnegat saw a sharp increase in muskrat harvest, but slight decreases for other species. In 1997, only five trappers worked the refuge at both Brigantine and Barnegat Divisions. The refuge trapping program is a tool to reduce animals that damage the dike system and to reduce predation. The 1994-99 harvests totals for the Refuge are depicted in Table 25.

Table 25. Total furbearer trapping harvest at Edwin B. Forsythe NWR, 1994-99								
Species	1994-95	1995-96	1996-97	1997-98	1998-99			
Raccoon	54	6	32	6	44			
Red & Grey Fox	47	11	18	6	9			
Mink	3	3	8	3	1			
Muskrat	96	53	47	54	58			
Opossum	6	0	16	0	35			
Skunk	0	0	0	0	3			
TOTAL	206	73	121	69	150			

11. Wildlife Observation

An estimated 112,700 visits were made to the refuge's Wildlife Drive in 1995, representing 79% of the Brigantine Division's 141,850 visits.

Unusually excellent weather conditions, and a variety of unusual wildlife viewing opportunities in January and February. 1995 brought thousands of visitors to the Wildlife Drive. In January 1995 almost 7.000 Drive visits occurred as visitors came out to catch a glimpse of the bald eagle, snowy owl, and short-eared owls which had been reported on birding hotlines.

In February 1995, almost 10,000 Wildlife Drive visits occurred as visitors came out to see the migratory waterfowl visible in thaw patches throughout refuge impoundments. Reports of snowy owl sightings also brought many birders to the refuge's Holgate Unit during February 1995. On February 19, 1995 approximately 790 visits were made to the Drive between 10 am and 5:40 pm.!

During the steamy summer months, when biting flies are unrelenting. Drive visitation is greatly reduced. But since visitors can view wildlife along the Drive from the comfort of their cars (windows rolled up and air conditioning on), thousands of visits continue to occur even under these inhospitable conditions. This year conditions were especially brutal: summer drought dried up refuge impoundments.

Two government shutdowns toward year-end greatly impacted wildlife viewing opportunities and visitation on the refuge. Due to government shutdown, the entire refuge -- including the Wildlife Drive, foot trails at the Brigantine Division, and all of Holgate -- were closed to all public access from November 13 - 19, 1995 and again from December 18, 1995 - January 6, 1996. As a result, Wildlife Drive visitation dipped precipitously in November and December: 36 percent and 56 percent, respectively, below figures for November 1994 and December 1994.

From 1995 through 1999, the refuge celebrated International Migratory Bird Day.

12. Other Wildlife Oriented Recreation

On October 6th, 1995 the Refuge celebrated its first National Wildlife Refuge Week Celebration by having a Refuge Open House. Several tables were set up under a tent where various environmental organizations could display there wares as well as making known what they were all about. Activities included nature walks, guided bird watching trips on the wildlife drive, decoy carving, and a slide show. Guest speakers included Congressman Frank LoBiondo and Deputy Director John Rogers. After the presentations, a rehabilitated redtailed hawk and a rehabilitated snowy egret were released to ooh's and aah's. From 1994 through 1999, the refuge hosted a National Wildlife Refuge Week event each year.



Charlie Stroup (a.k.a. Teddy Roosevelt) participated in the NWR week celebration, October, 1996.

A total of 6.841 recreational boaters launched from Scott's Landing during 1997.

14. Picnicking

While picknicking and jogging are not fostered at the refuge, some visitors do engage in these activities. The combined number of visitors engaged in these activities were estimated at 5,200 and 7,000 during 1997 and 1999, respectively.

15. Off-Road Vehicling

During this report period, people drove 4X4's down the beach at Holgate from about September 1 to March 31. A township permit was required. Because of the Wilderness Area status of Holgate, all vehicles had to operate below the mean high tide line. Even with posting the approximate tide line, enforcement of this regulation was difficult at best. Violations of this law occurs most frequently in areas narrowed by tidal erosion.

In 1995 the refuge stopped using orange posts to designate the vehicle prohibition area at the Holgate Unit. Area closed signs are posted closer to the tide to inhibit trespass and protect the dune areas.

The Oxycocus Rd. tract addition has many vehicle trespass violations. From ATVs to stolen abandoned vehicles to off-road partying, this newly acquired parcel will be better posted and all access roads gated. Presently, the local police and refuge high profile law enforcement patrols are used as deterrents.

17. Law Enforcement

In October, 1994 an illegal marijuana growing operation was discovered on the refuge, near the old McDonald House site. The location was reported to the refuge by Ralph Tiner, the Regional Wetlands expert, who discovered the plants while leading a wetlands plant identification course. New Jersey State Police were contacted and assisted in the investigation. Close to 40 plants, growing from five gallon buckets at a height of four to six feet, were collected and taken by State Police as evidence and to be destroyed. No suspects were ever apprehended.



Up to 40 illegal marijuana plants, near the old McDonald House.







In July. 1994 a single engine airplane made an emergency landing on Holgate due to mechanical problems. The plane landed safely at the 12,000 foot mark of Holgate, behind the area closed signs. The pilot was not injured in the landing. After the problem was identified and the problem corrected, the pilot was able to take off and continue to his home airport. Since it was an emergency, the pilot was not written up for any violations.



A single engine airplane made an emergency landing on Holgate due to mechanical problems. After the problem was corrected, the pilot was able to continue to his home airport

In March 1995, at the Reedy Creek Division, three individuals were observed shooting a handgun at a pond. An individual walking his dog was nearby. A brief verbal confrontation ensued, ending with the dog walker signing a complaint against the shooter for assault. The accused was a NJ State Trooper which prompted an internal investigation by the NJ State Police. After obtaining interviews from all involved, the township prosecutor did not find probable cause for a criminal action and dismissed the case.

In April 1995, RO Gormley found a blatant ATV trespass at the Barnegat Division. The operator was driving around a refuge gate into a closed area. A horizontal barrier was installed to inhibit the trespass. The perpetrator drove over the barrier and ultimately destroyed it. A more inhibiting barrier was installed, the operator decided to make his own trail through the woods. A covert surveillance was conducted without success.

In June 1995, Scott's Landing parking lot was frequently used for after-hours parties, vehicle break-ins and theft, and of course vandalism. At various times, the Galloway Township Police towed vehicles away. Apprehensions are few despite covert surveillance.

In June 1995, RO Gormley received information concerning a woman who was observed collecting Canada goose goslings on private property. RO Gormley and NJCO Tonnesen visited the residence and found twelve goslings, ranging in ages from two to four weeks. NJCO Tonnesen issued the appropriate Violation Notices.

In June 1995, RO Gormley apprehended several juveniles that built a structure in a closed area. No evidence was found prior to the apprehension of any drug or alcohol use. The individuals were instructed to disassemble the fortress and to remove all materials. They complied.

On June 29 1995, at approximately 6:30pm, a 16-year old male drowned in Spray Beach of Long Beach Island, 1 ½ hours after township lifeguards were off duty. Spray Beach is located approximately 4 miles north of the Holgate Unit. At approximately 12:45pm, June 30, Seasonal Refuge Officer (SRO) Brackett was alerted to a disturbance 200 feet to the north of the refuge boundary. Upon investigation, SRO Brackett found the remains of the drowning victim. He then assisted township personnel with securing the scene and crowd control.

Personal watercraft (jet skis) continued to plague the refuge throughout the 1995 summer season. At the Holgate Unit, jet skiers beached their watercrafts and walked throughout the closed dune areas. On the mainland marshes, the jet skiers traveled throughout the creeks, creating a disturbance for the nesting ospreys and other wildlife.

In September 1995, RO Gormley and Biologist Turner replaced the gate at Adamanson Rd. in Brick Township. This gate was an ongoing problem, it had already been replaced twice and received constant damage. A motion sensor/surveillance camera was purchased to assist in apprehending the persons responsible.

In September 1995, a vehicle was discovered abandoned in front of a refuge gate. Initial information obtained from the local police indicated the owner had a history of suicide attempts. A brief search of the area was unsuccessful in locating anyone. The vehicle later came back as stolen and was impounded by the local police. Evidence at the scene was collected and preserved for the investigating detective, however, no apprehensions were made.

In September 1995, while re-posting Holgate after high-tide sign damages. RO Gormley and SROS Banks observed the odor of marijuana from the vicinity of two individuals surf fishing as they drove passed their vehicle. RO Gormley dropped off SROS Banks at a safe location with some other surf fishers and approached the two. After a few minutes of verbal sparring.

the bag of marijuana was located and the driver of the vehicle was cited for possession of illegal drugs and released.

In October 1995, RO Gormley apprehended two local juveniles shooting yellow-rumped warblers and anything else that moved on private property which was adjacent to the refuge.

In November 1995, RO Gormley and NJCO Roberts checked two off-refuge waterfowl hunters, they were hunting one foot off of the refuge. Upon further observation, whole corn was discovered on the refuge, and in the water around their floating blind. The two were cited appropriately.

Law enforcement cases made during the 1995 hunting seasons included:

- hunting waterfowl over bait.
- hunting deer over bait.
- hunting from a permanent type tree stand.
- hunting deer without wearing the minimum blaze orange.
- hunting deer without the necessary permit.
- hunting deer in a closed area.
- over-bagging the daily limit of pintail
- hunting waterfowl while in possession of lead shot.
- hunting waterfowl with a shotgun capable of holding more than three shot shells.
- possessing a loaded weapon with in 450 feet of an occupied building (refuge deer hunter)
- freshwater fishing without a valid license

The 4th of July, 1996 holiday at Holgate was relatively quiet with no violations occurring during both daylight and nighttime hours. Historically, Holgate had been known as a source of problems during this holiday.

In November 1996, RO Gormley apprehended a deer hunter for hunting from an illegal tree stand. The violator was written up and deer stand as taken in as evidence.

Refuge Officers issued a total of 37 Violation Notices during 1996.

The Reedy Creek tract kept staff busy throughout 1996. This popular walking trail and teenager party site caused many problems. This area is one hour north of the Barnegat Division Headquarters, so apprehensions were few and far between. The main problem were die-hard partiers who broke through the gate to access their party area. Staff tried to work with local residents and Township Police, but still the gates were damaged routinely. In June 1996, a 39 year old female homeless person who was squatting on the Refuge with her boyfriend and his brother died. The woman had a heart attack and was DOA at the hospital. Refuge Officer Gormley worked with the remaining brothers and ultimately relocated them with friends. They cleaned their campground area before departing.



Officer Willard begins clean up of the squatter's campsite at the Reedy Creek Division. [KG]

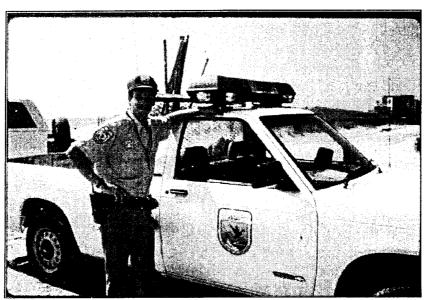
A total of 34 Violation Notices were issued by Refuge Officers throughout 1997. The violations included entering closed areas, possession of controlled dangerous substances, non-payment of the entrance fee, unleashed pets, used tire dumping, motor vehicle violations, theft of plants on the Refuge, take of non-game migratory bird, hunting waterfowl over bait, duck stamp violations, possessing lead shot while hunting waterfowl, hunting deer from an illegal tree stand, and other Refuge-specific hunting violations.

In May 1997, a serious motor vehicle accident occurred on the Refuge Wildlife Drive. The female operator of the vehicle, whose driver's license was suspended, was traveling approximately 40 mph in a posted 15 mph zone, when she lost control of the vehicle and hit a tree. She experienced neck and back pain and was airlifted to a local hospital trauma unit. The 18 year old owner/passenger of the vehicle sustained facial injuries and was treated and released at the hospital. Neither were wearing seatbelts. An 18 year old male, who was riding on the hood of the vehicle was thrown clear with no apparent injuries. He fled the scene due to outstanding arrest warrants. A 17 year old male was riding on the roof of the vehicle and was thrown into a wooded area causing two severe puncture wounds in his abdomen. He was also airlifted out and was in critical condition. He sustained liver damage and lost his spleen. The USFWS. Galloway Township Police Department and the Atlantic

County Prosecutors Office handled the case, which was prosecuted in local court. The most serious charge was a second degree aggravated assault charge against the driver, which carries maximum penalties of 10-30 years imprisonment.

In July 1997, Refuge Officer Kevin Gormley responded to a report of a possible marijuana garden on the Refuge in the vicinity of Route 9 at the Brigantine Division. Officer Gormley requested and received assistance from the Galloway Township Police Department and NJ State Police Drug Task Force. The Officers found two separate gardens on a tract of property the Refuge was in the process of purchasing. There were more than 340 plants weighing in excess of 100 pounds. Galloway Township and NJ State Police apprehended the two "farmers" later in the week. Officer Gormley received an Exceptional Service Award from the NJ Police Benevolent Association for his involvement.

In 1997, Parkertown Dock Road was posted along the roadway. This immediately brought public outcries for fishing, crabbing, and baitfishing access. A small turnoff along the roadway, which historically had been a popular crabbing location, remained available for refuge visitors. Special Use Permits were issued to the two known commercial bait-fishers.



Refuge Officer Willard takes on his new assignment at Brigantine Division.

In October 1997. Refuge Officer Willard contacted a man south of Parkertown Dock Road who had a SUP to retrieve a Korean war era plane that crashed in the marsh.

A total of 30 Violation Notices were issued during 1998. Numerous verbal and written warnings were issued throughout the year.

In 1998, due to the liberal changes pertaining to the baiting regulations in the Migratory Bird Treaty Act (MBTA), all waterfowl baiting cases were referred to the New Jersey Division of Fish, Game and Wildlife for prosecution.

Baiting waterfowl on and adjacent to the Refuge increased over the past several years. Special Agents from the Division of Law Enforcement weren't available to assist Refuge Officers with these cases. Given the understaffed Refuge Law Enforcement Program and the time consuming surveillance required, it was very difficult to apprehend these violators.

During the 1998 waterfowl hunting season, Refuge Officers made the first milo baiting case in Barnegat Bay in more than two decades. Although not the bait of choice for luring in waterfowl, it is much more difficult to detect, and is therefore becoming more popular. Whole and cracked corn is still the bait of choice among violators in the bay.

In addition to the illegal baiting apprehensions, other waterfowl hunting violations encountered in 1998 were late shooters, overbag of daily limits, duck stamp requirements, taking non-game migratory birds, possession of lead shot while hunting waterfowl and Refuge-specific regulations.

Most waterfowl hunters complied with the 1998 (first year) mandatory Hunter Information Program (HIP). Those who "forgot", were allowed to call the toll free number while in the field to obtain one, were allowed to continue to hunt and were issued warnings for noncompliance.

White-tailed deer hunt violations continued in 1998 with apprehensions including hunting from illegal tree stands and hunting over bait. Refuge Officers made the first acorn/oats baiting case this year.

A total of four hunting regulation orientations were held at the Barnegat and Brigantine Divisions in 1998. Refuge Officer Gormley and Biologist Turner administered the sessions.

Throughout the spring and summer of 1998, violations involving ATV/dirt bikes and jet skis continued to frustrate refuge officers. When confronted, these "outdoor enthusiasts" eluded apprehension by illegally traveling in foot pathways and in the case of the jet skis, mosquito ditches.

18. Cooperating Associations

In January 1995, the refuge provided wildlife-oriented posters and printed materials to a local boy scout troop who set up a bird-watching-oriented exhibit in a local mall.

In March 1995, ORP Rubenstein met with Communications Specialist Angela Graziano of the New Jersey Field Office. ORP Rubenstein provided information for the endangered species curriculum to be used by the Field Office as part of their Earth Stewards effort. She also briefed Ms. Graziano on potential on-refuge sites to which Field Office staff could bring Smithville School third-graders, on an Earth Stewards program visit. Hundreds of Smithville School students visited the refuge in subsequent months.

In 1995, the New York/New Jersey Harbor Estuary and New York Bight Restoration Program held a public meeting in the refuge auditorium, to review and receive comments on the draft comprehensive conservation and management plan for the harbor and the bight.

In 1995, ORP Rubenstein and Division Manager Banks met with John Gormley of the Barnegat Baymen's Museum. Discussion focused on developing an historic Barnegat Bay Seaport, and ways in which the refuge might cooperate in the development of an integrated interpretive message to the public.

In 1995, National Marine Fisheries Service personnel held a public meeting in the refuge auditorium to provide information to the public on new regulations being added to the Marine Mammal Protection Act.

In 1995, Mosquito Control Commissioners from throughout New Jersey used the auditorium as the site for their annual meeting.

In September 1995, ORP Rubenstein met with Janet Wolfe and Frank Gallagher, of the New Jersey Park Service's New Jersey Coastal Heritage Trail project. The meeting served to orient these project representatives to the refuge, and to discuss cooperative efforts in on-site project interpretive and identifying signs.

In 1995, ORP Rubenstein began her stint as the Service's representative to the New Jersey Watchable Wildlife steering committee. The committee developed a Watchable Wildlife Guide for New Jersey.

During 1995, the New Jersey Division of Marine Fisheries held its semi-monthly public meetings in the refuge auditorium.

The *Friends of Forsythe N.W.R.* was established in 1998 to support the refuge and its mission, to provide additional services for refuge visitors, and to assist the refuge staff in designated activities. Dr. Edgar Bristow, former president of the Atlantic Audubon Society, and long-time volunteer at the refuge, assumed the position of Board President. Within a few months, the Friends provided a 12 x 12 foot storage shed, located in the area set by the refuge for visitor information. With the help of AmeriCorps members, this building was converted to a small store, and the Friends Nature Store was opened in the Spring of 1999. This building also serves as an additional information service area to provide assistance to the visiting public. It is opened to the public on Saturdays and Sundays during the Refuge's busiest seasons - March through June and from September through December. Within its first year, approximately 2,000 visitors stopped through the Friends Nature store. Total donations from the sales outlet to Forsythe Refuge equaled \$1,139.00 its first year of operation.

Other achievements and activities by the Friends of Forsythe included:

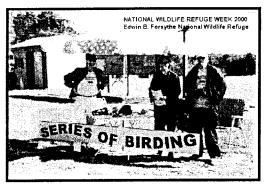
- Exhibit cases in information booth:
- Special walks on International Migratory Bird Day;
- Walks, birding tours, displays, free refreshments for National Wildlife Refuge Day;
- Guides for refuge tours for school groups, scouts and other tourist groups;
- Development of new display for auditorium (monthly calendar).

The *Atlantic Audubon Society*, founded in 1974, has been a leader in environmental activities locally, and on a state and national level since its inception. The society has been supporting the refuge since 1981 - the first local chapter of the National Audubon Society to officially "adopt" a National Wildlife Refuge. Working now under the Audubon Refuge Keeper (ARK) program, the chapter continues to provided needed assistance from habitat restoration to environmental education.



Mike O'Brien leading an Atlantic Audubon Society field excursion on the Wildlife Drive's observation tower. [JM]

In 1999, Atlantic Audubon Society member, John Williamson, designed a new and exciting program called the "Refuge Series of Birding" to raise community awareness of the Edwin B. Forsythe N.W.R. Community members were invited to participate in a short, fun-filled trip around the refuge in search of as many bird species as they could find. John served as "Umpire" for the event, with other members acting as "Scorers."



John Williamson and other referees of the Refuge Series of Birding [JM]

I. EQUIPMENT AND FACILITIES

1. New Construction

Long Dike -

In 1994, the refuge staff assisted in deploying a fabric used in construction of the new Long Dike. The new dike bisected the William Vogt West Pool (329 ha.) from west to east and create two sub-impoundments. The fabric was needed to prevent the fill material from sinking into the organic soil substrate. A heavy mesh plastic was placed down first as a support, followed by a fabric to prevent fill material from going through the mesh. Since some of the fabric was laid out during the winter, problems with wind moving the fabric and later freezing, caused plenty of headaches for the refuge staff. Also, ice had to be broken in order to put the fabric on the bottom of the impoundment. As the fabric was being placed, dump trucks with fill material would follow behind. Given the unconsolidated nature of the pool's bottom, even with the fabric, much of the fill ended up separating the layers of fabric and sinking into the pool. This miscalculation resulted in the need for at least twice as much fill as planned to properly complete the job. Since fabric deployment is all done by hand, work on this was painfully slow and took the entire year to complete two-thirds of the project.

The Long Dike construction was completed during 1997, creating the new Northwest and Southwest Pools. This project allowed for independent management of sub-impoundments to increase habitat diversity in managed wetlands. Enhancement of the sub-impoundments was completed by installation of additional water control structures. This provided improved water management capability to: improve water quality; restore wetland vegetation and habitat diversity; ensure future water supply with improved distribution capabilities throughout the impoundments; and reduced potential disease problems.

In 1997, new water control structures were constructed and installed at the Brigantine Division exterior dikes in the Northwest Pool and the East pool. A local Army Reserve Engineering Unit provided substantial assistance.

2. Rehabilitation

The Lily Lake dam rehabilitation project commenced in June, 1999. The dike was built in the 1910's or 1920's. The dike was overgrown with large trees that prevented proper dike maintenance. Two spillways, one on either side of the dike, drained the lake to a certain

level, but no water control structure was in place, precluding proper water management. The rehabilitation project called for removing all woody vegetation, rebuilding and reshaping the dike, and installing a water control structure including a weir, a gate with heavy duty steel flash boards, and a screw gate. This project would enhance management of Lily Lake as a reservoir for downstream managed wetland impoundments.

4. Equipment Utilization and Replacement

On July 31, 1996 the Barnegat Division's phone system was knocked out of commission due to a lightning strike on the phone line. Division Manager Banks was actually on the phone when the incident occurred. She was not injured. On February 7, 1997 a new phone system would be installed at the Barnegat HQ.

The following equipment was purchased during the period 1994 - 99.

09-26-99	Tiger Side Arm Mower, REB 14-C, 3 point hitch
03-03-99	John Deere Tractor, 5510, with bucket loader, 4wd, 60hp
07-09-98	Ford F-150 Truck, extended cab, 8 ft bed, 4X4 for Barnegat Div.
07-09-98	Ford F-150 Truck, extended cab. 6 ft bed, 4X4, V-8 for LE officer
01-20-98	Dodge Pickup Truck, Ram 1500, 2X4, 6 cyl., 8 ft bed
01-20-98	Dodge Pickup Truck, Ram 1500, 2X4, 6 cyl., 8 ft bed for Barnegat Div.
07-16-97	X Mark Lazer Z riding lawn mower
05-24-95	Echo power saw, extendable pole type
12-12-95	Ford Bronco for Barnegat Division
09-26-94	Eager beaver trailer, 20 ton

5. Communications System

In April 1994, staff from the Brigantine Division assisted the Barnegat staff to erect a base radio tower. The tower was blown down in a storm several years prior, and because of this, radio communication to the Barnegat Division was fair at best. Before the repair, the height of the tower was only 12 feet, and it was attached to the headquarters compound fence. Segments of the tower that were not destroyed in the storm were reconstructed, to make a new tower. The Chevy Fire Truck, equipped with a winch, was used to help erect the tower. After the tower was up, the guy wires were readjusted and tighten up. By days end, the tower stood at 40 feet. Needless to say, communications were greatly improved to the Barnegat Division.

In August 1995, a portable radio was stolen from a volunteer at the Holgate Unit. The volunteer temporarily left his post and when he returned the radio was missing. Seasonal Officer Brackett investigated the incident without success.

The 1992 Ford F-150 experienced radio problems during 1995. The Motorola radio, model #D51MJA93A5AK, intermittently shut off transmissions after only two seconds of keying the microphone. The only way to transmit when this occurred was to "strobe" the microphone key. A Motorola repair shop diagnosed the problem as a fungus caused by the atmospheric conditions by the east coast environment. This was a sporadic problem, therefore making it very difficult to diagnose.

In October 1995, a new telephone system was installed at the Brigantine Division. This replaced a system that was seven years old and was rapidly falling apart. The manufacturer no longer made or supported the old telephones, and by the time the new system was installed there were only three working telephones for a staff of eight people. The new system allowed each staff member to have a working telephone and have of voice mail.

6. Computer Systems

In May 1997, the refuge received new computers for each of the Barnegat Division staff members. After years of the division working of one computer for Internet and report writing, Barnegat finally stepped into the 20th century. Computer set-up took place over the next several weeks.

Brigantine Division's computer system was networked in November 1999. A desktop computer operated as our server. Also, all refuge staff had access to a computer and had

email accounts. Several printers were available through the network to all staff in the Brigantine Division building.

A "public" drive was created on our server computer to serve as a storage area for files that are accessible by all computers at the Brigantine Division. This allows us to share data and provide files for review without having to copy to disks or print hard copies.

8. Other

In August 1994, after months of paying for sewer service on a refuge house that was not occupied. Barnegat Township Utilities came out and capped the sewer line to the old Florence Gun Club building. The refuge inherited the building after the land was purchased by the refuge. Since it was no longer used as a hunt club and was not suitable for refuge housing, plans were made to raze the building in 1995.

In January 1997, a contractor demolished and removed a refuge house known as the McDonald House. The house was located along U.S. Rt. 9 in the town of New Gretna. The house was acquired as part of the land purchase in the 1980's. The house was used as government housing until it was deemed not financially feasible to make any repairs to the house.

J. OTHER ITEMS

4. Credits

The production of this narrative has required the efforts of many people, all of them giving their time, energy and expertise. In addition, each of our reviewers deserves our thanks and appreciation

Name	Sections
Atzert	C1, D1, E1, K
Coppen	Introduction, A. B, C1, D5, E8, F1, F2, F6, G1-17, H8, I1-2, J4
Hand	E1, E5, E7, I4-6
Heffley	H2-3, L

Rubenstein	H1-16, H18
Turner	E7, F2, F9-10, F12, G2, G8-9, G15-17, H8, H10, I8
Jones	G3-6
Perchetti	E2-4
Willard	E6, H15, H17
Gormley	H17

Photo credits:			
Name	Initials	.,	
John Matteoni	JM		
Ed Jones	EJ		
Linda Rubenstein	LR		
Kevin Gormley	KM		

K. FEEDBACK